ALGEBRA

II

The University of the State of New York
REGENTS HIGH SCHOOL EXAMINATION

ALGEBRA II

Monday, June 24, 2024 — 9:15 a.m. to 12:15 p.m., only

Student Name _____

School Name _____

The possession or use of any communications device is strictly prohibited when taking this examination. If you have or use any communications device, no matter how briefly, your examination will be invalidated and no score will be calculated for you.

Print your name and the name of your school on the lines above.

A separate answer sheet for **Part I** has been provided to you. Follow the instructions from the proctor for completing the student information on your answer sheet.

This examination has four parts, with a total of 37 questions. You must answer all questions in this examination. Record your answers to the Part I multiple-choice questions on the separate answer sheet. Write your answers to the questions in **Parts II, III,** and **IV** directly in this booklet. All work should be written in pen, except graphs and drawings, which should be done in pencil. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale.

The formulas that you may need to answer some questions in this examination are found at the end of the examination. This sheet is perforated so you may remove it from this booklet.

Scrap paper is not permitted for any part of this examination, but you may use the blank spaces in this booklet as scrap paper. A perforated sheet of scrap graph paper is provided at the end of this booklet for any question for which graphing may be helpful but is not required. You may remove this sheet from this booklet. Any work done on this sheet of scrap graph paper will not be scored.

When you have completed the examination, you must sign the statement printed at the end of the answer sheet, indicating that you had no unlawful knowledge of the questions or answers prior to the examination and that you have neither given nor received assistance in answering any of the questions during the examination. Your answer sheet cannot be accepted if you fail to sign this declaration.

Notice ...

A graphing calculator and a straightedge (ruler) must be available for you to use while taking this examination.

DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL THE SIGNAL IS GIVEN.

Part I

Answer all 24 questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For each statement or question, choose the word or expression that, of those given, best completes the statement or answers the question. Record your answers on your separate answer sheet. [48]

Use this space for computations.

1 Which expression is equivalent to $(x + 3)^2 + 4(x + 3) - 5$?

(1) $(x + 5)(x - 1)$

(2) $(x + 8)(x + 2)$

(3) $(x - 2)(x + 4)$

(4) $x^2 + 4x + 16$

2 Which value, to the *nearest tenth*, is an approximate solution for the equation $f(x) = g(x)$, if $f(x) = \frac{5}{x - 3}$ and $g(x) = 2(1.3)^x$?

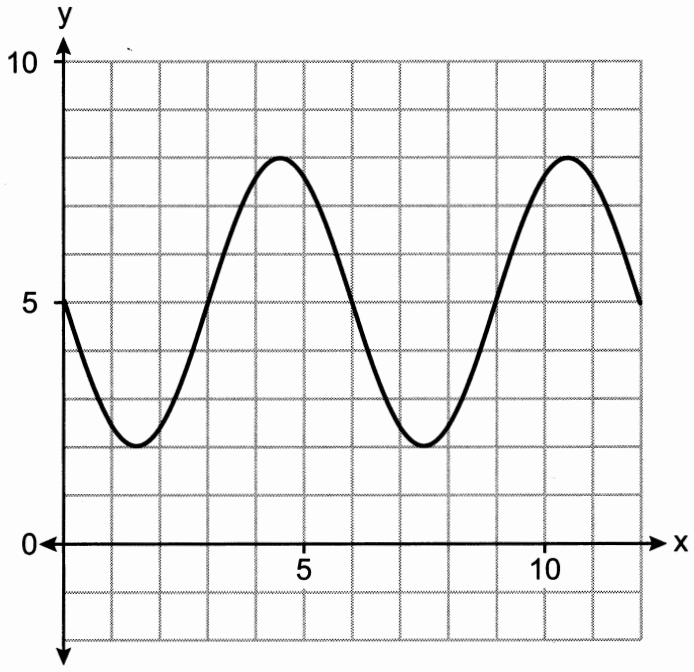
(1) 3.2

(2) 3.9

(3) 4.0

(4) 5.6

3 Which equation is graphed in the diagram below?



(1) $y = -3\sin\left(\frac{\pi}{3}x\right) + 5$

(2) $y = -3\cos\left(\frac{\pi}{3}x\right) + 5$

(3) $y = -5\sin\left(\frac{\pi}{3}x\right) + 3$

(4) $y = -5\cos\left(\frac{\pi}{3}x\right) + 3$

Use this space for computations.

4 Which point is in Quadrant III and is a solution to the system below?

$$y = x^2 - 24$$
$$y = x - 12$$

(1) $(4,-8)$

(2) $(-3,-15)$

(3) $(-4,-16)$

(4) $(-3,-33)$

5 For which equations will the value $s = 4$ make the statement an identity?

I. $(2x - 3)^2 = 4x^2 - 3sx + 9$

II. $(x - 2)^3 = (x - 2)(x^2 + sx + s)$

(1) I, only

(2) II, only

(3) I and II

(4) neither I nor II

6 The number of bacteria in a sample, which can be modeled by an exponential regression, is shown in the table below.

Time Since Observation Began (hours)	0	1	2	3.5	4
Number of Bacteria	40	48	57	75	82

Assuming this trend continues, approximately how many bacteria would be present 8 hours after the observation began?

(1) 123

(2) 127

(3) 168

(4) 180

Use this space for computations.

7 Factored completely, $x^4 + 4x^3 - 9x^2 - 36x$ is equivalent to

(1) $x(x + 9)(x - 9)(x + 4)$

(2) $x(x + 3)(x - 3)(x + 4)$

(3) $(x^3 - 9x)(x + 4)$

(4) $x(x^2 - 9)(x + 4)(x + 4)$

8 The solution set for the equation $x + 1 = \sqrt{4x + 25}$ is

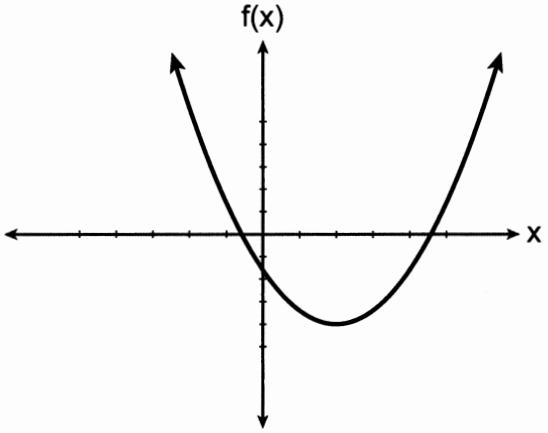
(1) $\{\}$

(2) $\{6\}$

(3) $\{6,-4\}$

(4) $\{-4\}$

9 If $f(x)$ is represented by the graph below, which translation of $f(x)$ would have imaginary roots?



(1) $f(x + 5)$

(2) $f(x - 5)$

(3) $f(x) + 5$

(4) $f(x) - 5$

Use this space for computations.

10 The solutions to the equation $3x^2 - 4x + 2 = 2x - 3$ are

(1) $\frac{2}{3} \pm \frac{\sqrt{2}}{3}i$

(2) $1 \pm \frac{\sqrt{6}}{3}i$

(3) $1 \pm \frac{\sqrt{12}}{3}$

(4) $1 \pm 2\sqrt{6}i$

11 A culture of 1000 bacteria triples every 10 hours. Which expression models the number of bacteria in the sample after t hours?

(1) $1000e^{3t}$

(2) $1000(3)^{t}$

(3) $1000(3)^{10t}$

(4) $1000(3)^{\frac{t}{10}}$

12 An initial investment of \$5000 in an account earns 3.5% annual interest. Which function correctly represents a recursive model of the investment after n years?

(1) $A = 5000(0.035)^n$

(2) $a_0 = 5000$
$a_n = a_{n-1}(0.035)$

(3) $A = 5000(1.035)^n$

(4) $a_0 = 5000$
$a_n = a_{n-1}(1.035)$

Use this space for computations.

13 Which expression is equivalent to $2xy^2\sqrt[3]{x^2y}$?

(1) $2x^{\frac{5}{3}}y^{\frac{7}{3}}$

(2) $2xy$

(3) $2x^{\frac{2}{3}}y^{\frac{2}{3}}$

(4) $2x^7y^4$

14 Which statements must be true about the polynomial function $k(x) = -2x^3 - 11x^2 - 12x + 9$?

I. $(x - 3)$ is a factor of $k(x)$

II. $k(0) = 9$

III. $\frac{k(x)}{x + 2}$ has a remainder of 5

(1) II, only

(2) I and II

(3) II and III

(4) I, II, and III

15 To prepare for lacrosse tryouts, Kole is increasing the amount of time he spends at the gym. This week he is spending 150 minutes there and he plans to increase this amount by 2% each week. The amount of time, in minutes, that he plans to spend at the gym t weeks from now is given by the function $A(t) = 150(1.02)^t$.

In terms of a daily growth rate, the amount of time Kole is planning to spend at the gym can best be modeled by the function

(1) $A(t) = 150(1.14869)^{\frac{t}{7}}$

(2) $A(t) = 150(1.14869)^{7t}$

(3) $A(t) = 150(1.00283)^{\frac{t}{7}}$

(4) $A(t) = 150(1.00283)^{7t}$

Use this space for computations.

16 Mr. Zachary posts review assignments on the Betamath website for his students. On his last test, 49% of his students used Betamath and passed. Overall, 68% of his students used Betamath. Approximately what percentage of Mr. Zachary's students passed, given that they used Betamath?

(1) 19%
(2) 32%
(3) 33%
(4) 72%

17 Given $\sin\theta = \frac{7}{25}$ and θ terminates in Quadrant II, what is the value of $\tan\theta$?

(1) $-\frac{7}{24}$
(2) $-\frac{24}{7}$
(3) $\frac{7}{24}$
(4) $\frac{24}{7}$

18 A family owned grocery store in New Hartford, NY employs 49 people whose ages are approximately normally distributed with a mean of 36 years and a standard deviation of 6.2 years. Ryan has been hired to work at this store. He is 30 years old. How many people who work at this store would you expect to be younger than Ryan?

(1) 17
(2) 7
(3) 41
(4) 8

19 For the function $d(x) = \sqrt[3]{x+2}$, the inverse function, $d^{-1}(x)$, equals

(1) $\sqrt[3]{x+2}$
(2) $x^3 + 2$
(3) $-\sqrt[3]{x+2}$
(4) $x^3 - 2$

Use this space for computations.

20 Given $f(x) = x^4 + x^3 - 3x^2 + 9x - 108$ and $f(3) = 0$, which values satisfy $f(x) = 0$?

(1) $-4, 3$ only

(2) $-3, 4$ only

(3) $\pm 3i, -4, 3$

(4) $\pm 3i, -3, 4$

21 The profit function, $p(x)$, is found by subtracting the cost function, $c(x)$, from the revenue function, $r(x)$. Which function below represents the cost function given $p(x) = -15x^2 + 600x + 60$ and $r(x) = -0.4x^2 + 130x + 1200$?

(1) $c(x) = -14.6x^2 + 470x - 1140$

(2) $c(x) = -14.6x^2 + 730x - 1260$

(3) $c(x) = 14.6x^2 - 470x + 1140$

(4) $c(x) = 14.6x^2 + 730x - 1260$

22 What is the remainder when $4x^3 - 3x + 3$ is divided by $x - 2$?

(1) -23

(2) -7

(3) 13

(4) 29

Use this space for computations.

23 The parabola with equation $12(y + 1) = (x - 4)^2$ has

(1) a vertex at (4,2)

(2) a focus at $(4,-1)$

(3) a directrix $y = -4$

(4) four units between the focus and vertex

24 Jay is training for a bike race over fifteen weeks. At the end of the first week, he has ridden ten miles, and he is planning to increase his weekly distance by nine percent each week. Approximately how many miles total will he have ridden from the beginning of his training to the end of the fifteenth week?

(1) 10.989

(2) 33.417

(3) 163.5

(4) 293.609

Part II

Answer all 8 questions in this part. Each correct answer will receive 2 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [16]

25 Given x is a real number, write the expression in simplest $a + bi$ form:

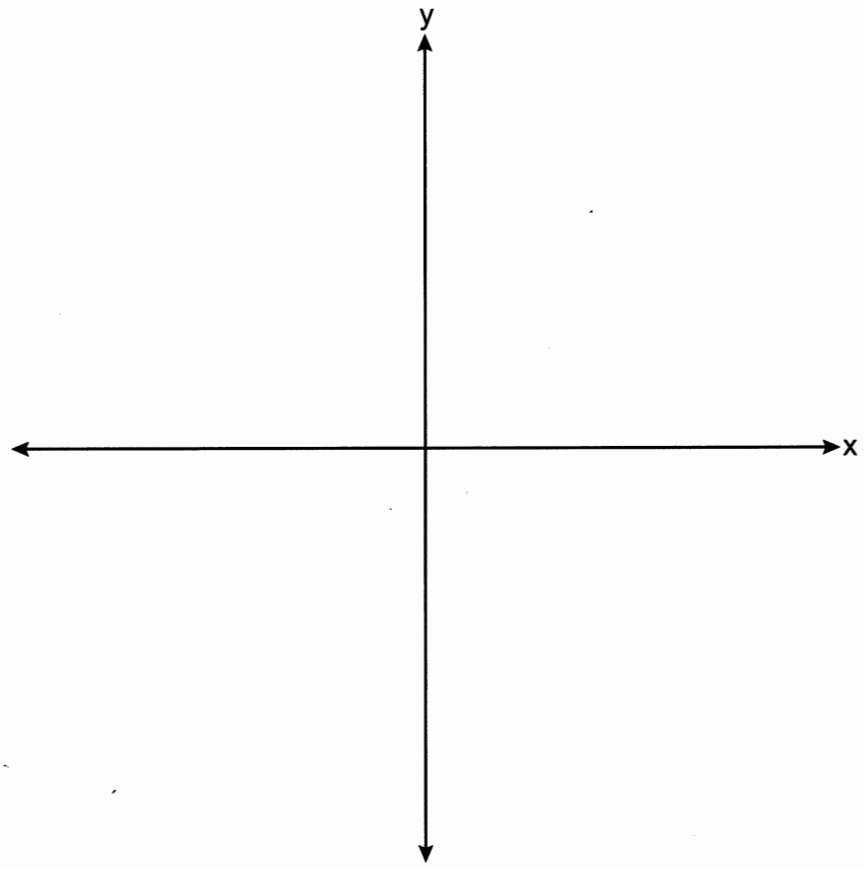
$$(x + 2i)(3 - 2xi) + 2x^2i$$

26 Solve $3.8e^{1.5t} = 16$ algebraically for t to the *nearest hundredth*.

27 In an attempt to get the student body's opinion of a new dress code, members of the statistics class surveyed the students of the first period computer science class. Explain a statistical bias in the method of data collection.

28 Sketch a graph of polynomial $P(x)$, given the criteria below:

- $P(x)$ has zeros only at -5, 1, and 4
- As $x \to \infty$, $P(x) \to -\infty$
- As $x \to -\infty$, $P(x) \to -\infty$



29 The height, above ground, of a Ferris wheel car can be modeled by the function $h(t) = -103.5\cos\left(\frac{2\pi t}{5}\right) + 108.5$ where h is measured in feet and t is measured in minutes. State the period of the function and describe what the period represents in this context.

30 Solve algebraically for all values of x:

$$\frac{8}{x+5} - \frac{3}{x} = 5$$

31 The transportation methods used by the upperclassmen at Calhoun High School are summarized in the table below.

Upperclassmen Transportation Methods

	Drive	Take the Bus	Walk
Junior	58	75	12
Senior	81	39	12

Are the events "being a junior" and "driving to school" independent? Using statistical evidence, justify your answer.

32 Can $f(x) = x^3 + 7$ be classified as an odd function? Justify your answer.

Part III

Answer all 4 questions in this part. Each correct answer will receive 4 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [16]

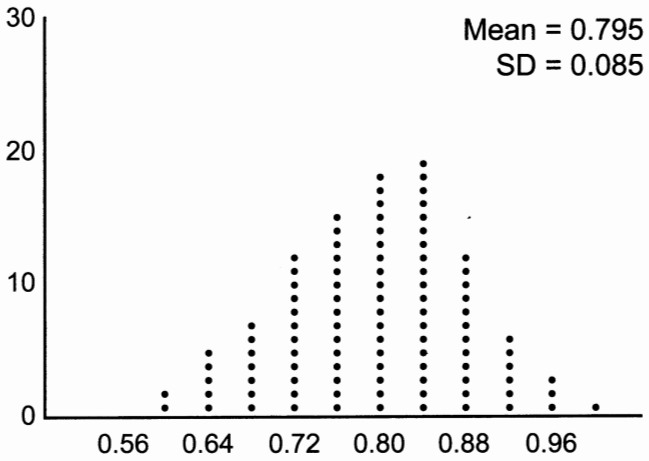
33 Solve the following system of equations algebraically for all values of x, y, and z:

$$3x - 8y + 2z = -60$$
$$2x - 7y - 5z = -31$$
$$-6x + 2y - 4z = 36$$

34 In the town of Skaneateles, New York, house prices since 2008 have changed based on the function $H(t) = 200{,}000(1.045)^t$, where t is the number of years since 2008 and $H(t)$ is the median house price. Determine the average rate of change for the median house price in Skaneateles from 2010 to 2018 to the *nearest dollar per year*.

Explain what this rate of change means as it relates to median house prices.

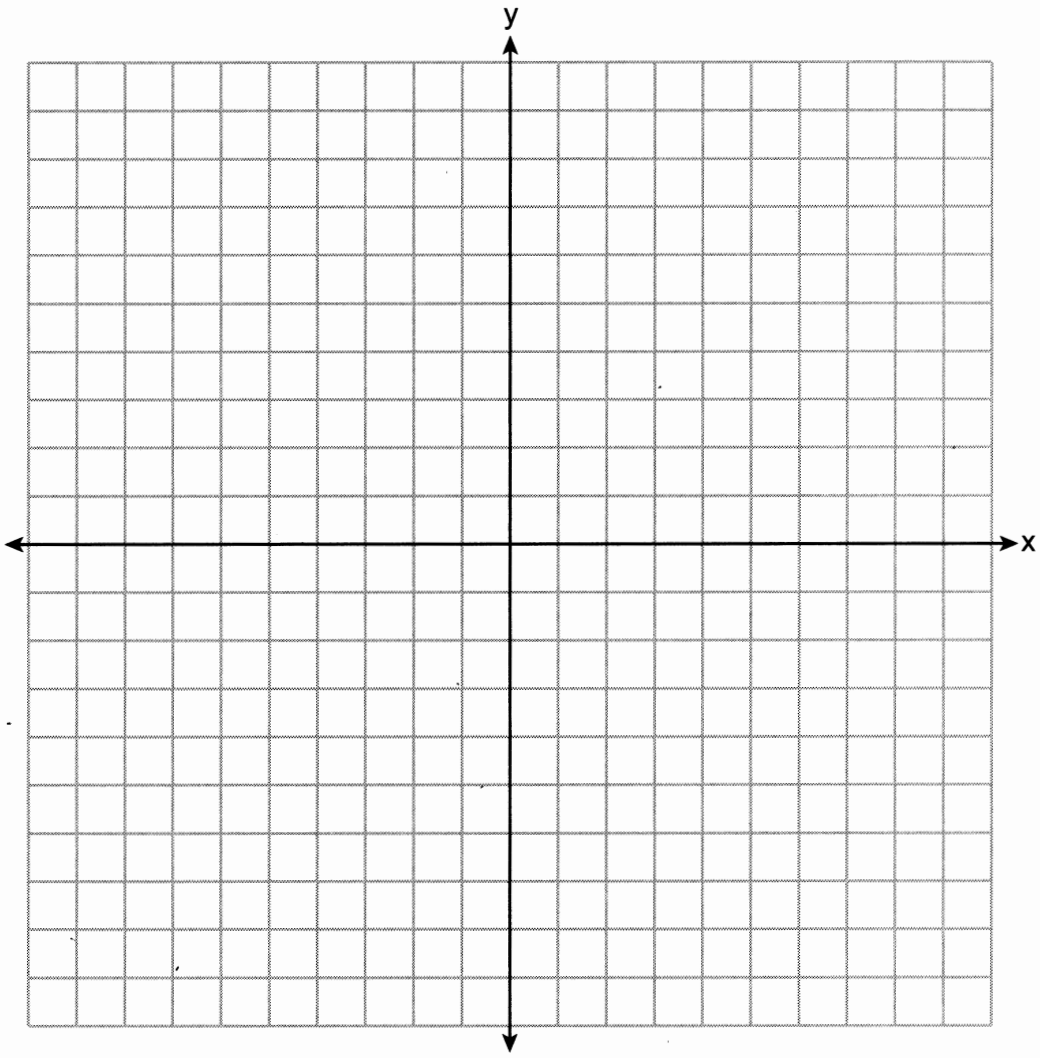
35 A sporting goods manufacturer is trying to determine if they should continue to produce multiple types of hockey pucks. The company surveyed 50 randomly chosen customers and asked them if they purchased both game regulation pucks and lighter training pucks. Of those surveyed, 40 of them said that they purchase both types of pucks. A simulation that was run 100 times based on the survey results produced the approximately normal results below.



a) Determine an interval containing the middle 95% of plausible values that estimates the proportion of all customers who would purchase both types of pucks from the company.

b) The company will continue to manufacture both types of hockey pucks if it is reasonable to assume that the true proportion of customers who buy both types of hockey pucks is above 0.60. Using the interval from part *a*, explain whether or not the company should continue to produce both types of hockey pucks.

36 Graph $y = f(x)$, where $f(x) = \log_2(x - 1) + 3$ on the set of axes below.



State the equation of the asymptote of $f(x)$.

When $f(x)$ is reflected over the line $y = x$, a new function is formed: $g(x) = 2^{x-3} + 1$.
State the equation of the asymptote of $g(x)$.

Part IV

Answer the question in this part. A correct answer will receive 6 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided to determine your answer. Note that diagrams are not necessarily drawn to scale. A correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [6]

37 Megan is performing an experiment in a lab where the air temperature is a constant 73°F and the liquid is 237°F. One and a half hours later, the temperature of the liquid is 112°F. Newton's law of cooling states $T(t) = T_a + (T_0 - T_a)e^{-kt}$ where:

$T(t)$: temperature, °F, of the liquid at t hours
T_a: air temperature
T_0: initial temperature of the liquid
k: constant

Determine the value of k, to the *nearest thousandth*, for this liquid.

Question 37 is continued on the next page.

Question 37 continued

Determine the temperature of the liquid using your value for k, to the *nearest degree*, after two and a half hours.

Megan needs the temperature of the liquid to be 80°F to perform the next step in her experiment. Use your value for k to determine, to the *nearest tenth of an hour*, how much time she must wait since she first began the experiment.

The State Education Department / The University of the State of New York

Regents Examination in Algebra II – June 2024

Scoring Key: Part I (Multiple-Choice Questions)

Examination	Date	Question Number	Scoring Key	Question Type	Credit
Algebra II	June '24	**1**	2	MC	2
Algebra II	June '24	**2**	2	MC	2
Algebra II	June '24	**3**	1	MC	2
Algebra II	June '24	**4**	2	MC	2
Algebra II	June '24	**5**	1	MC	2
Algebra II	June '24	**6**	3	MC	2
Algebra II	June '24	**7**	2	MC	2
Algebra II	June '24	**8**	2	MC	2
Algebra II	June '24	**9**	3	MC	2
Algebra II	June '24	**10**	2	MC	2
Algebra II	June '24	**11**	4	MC	2
Algebra II	June '24	**12**	4	MC	2
Algebra II	June '24	**13**	1	MC	2
Algebra II	June '24	**14**	3	MC	2
Algebra II	June '24	**15**	4	MC	2
Algebra II	June '24	**16**	4	MC	2
Algebra II	June '24	**17**	1	MC	2
Algebra II	June '24	**18**	4	MC	2
Algebra II	June '24	**19**	4	MC	2
Algebra II	June '24	**20**	3	MC	2
Algebra II	June '24	**21**	3	MC	2
Algebra II	June '24	**22**	4	MC	2
Algebra II	June '24	**23**	3	MC	2
Algebra II	June '24	**24**	4	MC	2

Regents Examination in Algebra II – June 2024

Scoring Key: Parts II, III, and IV (Constructed-Response Questions)

Examination	Date	Question Number	Scoring Key	Question Type	Credit
Algebra II	June '24	**25**	-	CR	2
Algebra II	June '24	**26**	-	CR	2
Algebra II	June '24	**27**	-	CR	2
Algebra II	June '24	**28**	-	CR	2
Algebra II	June '24	**29**	-	CR	2
Algebra II	June '24	**30**	-	CR	2
Algebra II	June '24	**31**	-	CR	2
Algebra II	June '24	**32**	-	CR	2
Algebra II	June '24	**33**	-	CR	4
Algebra II	June '24	**34**	-	CR	4
Algebra II	June '24	**35**	-	CR	4
Algebra II	June '24	**36**	-	CR	4
Algebra II	June '24	**37**	-	CR	6

Key
MC = Multiple-choice question
CR = Constructed-response question

The chart for determining students' final examination scores for the **June 2024 Regents Examination in Algebra II** will be posted on the Department's web site at: https://www.nysedregents.org/algebratwo/ on the day of the examination. Conversion charts provided for the previous administrations of the Regents Examination in Algebra II must NOT be used to determine students' final scores for this administration.

FOR TEACHERS ONLY

The University of the State of New York
REGENTS HIGH SCHOOL EXAMINATION

ALGEBRA II

Monday, June 24, 2024 — 9:15 a.m. to 12:15 p.m., only

RATING GUIDE

Updated information regarding the rating of this examination may be posted on the New York State Education Department's web site during the rating period. Check this web site at: https://www.nysed.gov/state-assessment/high-school-regents-examinations and select the link "Scoring Information" for any recently posted information regarding this examination. This site should be checked before the rating process for this examination begins and several times throughout the Regents Examination period.

The Department is providing supplemental scoring guidance, the "Model Response Set," for the Regents Examination in Algebra II. This guidance is intended to be part of the scorer training. Schools are encouraged to incorporate the Model Response Sets into the scorer training or to use them as additional information during scoring. While not reflective of all scenarios, the model responses selected for the Model Response Set illustrate how less common student responses to constructed-response questions may be scored. The Model Response Set will be available on the Department's web site at https://www.nysedregents.org/algebratwo/.

Mechanics of Rating

The following procedures are to be followed for scoring student answer papers for the Regents Examination in Algebra II. More detailed information about scoring is provided in the publication *Information Booklet for Scoring the Regents Examination in Algebra II*.

Do *not* attempt to correct the student's work by making insertions or changes of any kind. In scoring the constructed-response questions, use check marks to indicate student errors. Unless otherwise specified, mathematically correct variations in the answers will be allowed. Units need not be given when the wording of the questions allows such omissions.

Each student's answer paper is to be scored by a minimum of three mathematics teachers. No one teacher is to score more than approximately one-third of the constructed-response questions on a student's paper. Teachers may not score their own students' answer papers. On the student's separate answer sheet, for each question, record the number of credits earned and the teacher's assigned rater/scorer letter.

Schools are not permitted to rescore any of the constructed-response questions on this exam after each question has been rated once, regardless of the final exam score. Schools are required to ensure that the raw scores have been added correctly and that the resulting scale score has been determined accurately.

Raters should record the student's scores for all questions and the total raw score on the student's separate answer sheet. Then the student's total raw score should be converted to a scale score by using the conversion chart that will be posted on the Department's web site at: https://www.nysed.gov/state-assessment/ by Monday, June 24, 2024. Because scale scores corresponding to raw scores in the conversion chart may change from one administration to another, it is crucial that, for each administration, the conversion chart provided for that administration be used to determine the student's final score. The student's scale score should be entered in the box provided on the student's separate answer sheet. The scale score is the student's final examination score.

General Rules for Applying Mathematics Rubrics

I. General Principles for Rating

The rubrics for the constructed-response questions on the Regents Examination in Algebra II are designed to provide a systematic, consistent method for awarding credit. The rubrics are not to be considered all-inclusive; it is impossible to anticipate all the different methods that students might use to solve a given problem. Each response must be rated carefully using the teacher's professional judgment and knowledge of mathematics; all calculations must be checked. The specific rubrics for each question must be applied consistently to all responses. In cases that are not specifically addressed in the rubrics, raters must follow the general rating guidelines in the publication *Information Booklet for Scoring the Regents Examination in Algebra II*, use their own professional judgment, confer with other mathematics teachers, and/or contact the State Education Department for guidance. During each Regents Examination administration period, rating questions may be referred directly to the Education Department. The contact numbers are sent to all schools before each administration period.

II. Full-Credit Responses

A full-credit response provides a complete and correct answer to all parts of the question. Sufficient work is shown to enable the rater to determine how the student arrived at the correct answer.

When the rubric for the full-credit response includes one or more examples of an acceptable method for solving the question (usually introduced by the phrase "such as"), it does not mean that there are no additional acceptable methods of arriving at the correct answer. Unless otherwise specified, mathematically correct alternative solutions should be awarded credit. The only exceptions are those questions that specify the type of solution that must be used; e.g., an algebraic solution or a graphic solution. A correct solution using a method other than the one specified is awarded half the credit of a correct solution using the specified method.

III. Appropriate Work

Full-Credit Responses: The directions in the examination booklet for all the constructed-response questions state: "Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc." The student has the responsibility of providing the correct answer ***and*** showing how that answer was obtained. The student must "construct" the response; the teacher should not have to search through a group of seemingly random calculations scribbled on the student paper to ascertain what method the student may have used.

Responses With Errors: Rubrics that state "Appropriate work is shown, but…" are intended to be used with solutions that show an essentially complete response to the question but contain certain types of errors, whether computational, rounding, graphing, or conceptual. If the response is incomplete; i.e., an equation is written but not solved or an equation is solved but not all of the parts of the question are answered, appropriate work has ***not*** been shown. Other rubrics address incomplete responses.

IV. Multiple Errors

Computational Errors, Graphing Errors, and Rounding Errors: Each of these types of errors results in a 1-credit deduction. Any combination of two of these types of errors results in a 2-credit deduction. No more than 2 credits should be deducted for such mechanical errors in a 4-credit question and no more than 3 credits should be deducted in a 6-credit question. The teacher must carefully review the student's work to determine what errors were made and what type of errors they were.

Conceptual Errors: A conceptual error involves a more serious lack of knowledge or procedure. Examples of conceptual errors include using the incorrect formula for the area of a figure, choosing the incorrect trigonometric function, or multiplying the exponents instead of adding them when multiplying terms with exponents.

If a response shows repeated occurrences of the same conceptual error, the student should not be penalized twice. If the same conceptual error is repeated in responses to other questions, credit should be deducted in each response.

For 4- and 6-credit questions, if a response shows one conceptual error and one computational, graphing, or rounding error, the teacher must award credit that takes into account both errors. Refer to the rubric for specific scoring guidelines.

Part II

For each question, use the specific criteria to award a maximum of 2 credits. Unless otherwise specified, mathematically correct alternative solutions should be awarded appropriate credit.

(25) **[2]** $7x + 6i$, and correct work is shown.

[1] Appropriate work is shown, but one computational or simplification error is made.

or

[1] Appropriate work is shown, but one conceptual error is made.

or

[1] $7x + 6i$, but no work is shown.

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(26) **[2]** 0.96, and correct algebraic work is shown.

[1] Appropriate work is shown, but one computational or rounding error is made.

or

[1] Appropriate work is shown, but one conceptual error is made.

or

[1] 0.96, but a method other than algebraic is used.

or

[1] 0.96, but no work is shown.

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(27) **[2]** A correct statistical bias is explained, such as the data collected will not be a random representation of the entire student body.

[1] One conceptual error is made.

or

[1] An incomplete explanation is written.

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(28) **[2]** A correct graph is drawn.

[1] Appropriate work is shown, but one graphing error is made.

or

[1] Appropriate work is shown, but one conceptual error is made.

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(29) **[2]** 5, and a correct description is written.

[1] Appropriate work is shown, but one computational error is made.

or

[1] Appropriate work is shown, but one conceptual error is made.

or

[1] 5, but the description is incomplete or missing.

or

[1] A correct description is written, but no further correct work is shown.

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(30) **[2]** $-3,-1$, and correct algebraic work is shown.

[1] Appropriate work is shown, but one computational error is made.

or

[1] Appropriate work is shown, but one conceptual error is made.

or

[1] A correct quadratic equation in standard form is written, but no further correct work is shown.

or

[1] $-3,-1$, but a method other than algebraic is used.

or

[1] $-3,-1$, but no work is shown.

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(31) **[2]** A negative response is indicated, and a correct justification is given.

[1] Appropriate work is shown, but one computational error is made.

or

[1] Appropriate work is shown, but one conceptual error is made.

or

[1] No, but the justification is incomplete.

[0] No, but the justification is incorrect or missing.

or

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(32) **[2]** No, and a correct justification is given.

[1] Appropriate work is shown, but one computational error is made.

or

[1] Appropriate work is shown, but one conceptual error is made.

or

[1] No, but an incomplete justification is given.

[0] No, but no justification is given.

or

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

Part III

For each question, use the specific criteria to award a maximum of 4 credits. Unless otherwise specified, mathematically correct alternative solutions should be awarded appropriate credit.

(33) **[4]** $x = -2$, $y = 6$, and $z = -3$, and correct algebraic work is shown.

[3] Appropriate work is shown, but one computational error is made.

or

[3] Appropriate work is shown to find two correct values, but no further correct work is shown.

[2] Appropriate work is shown, but two or more computational errors are made.

or

[2] Appropriate work is shown, but one conceptual error is made.

or

[2] Appropriate work is shown to find one correct value, but no further correct work is shown.

or

[2] $x = -2$, $y = 6$, and $z = -3$, but a method other than algebraic is used.

[1] Appropriate work is shown, but one conceptual and one computational error are made.

or

[1] Appropriate work is shown to eliminate one variable to create a system of two equations with two variables, but no further correct work is shown.

or

[1] $x = -2$, $y = 6$, and $z = -3$, but no work is shown.

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(34) **[4]** 11,524 and correct work is shown, and a correct explanation is written.

[3] Appropriate work is shown, but one computational or rounding error is made.

or

[3] Appropriate work is shown to find 11,524, but the explanation is incomplete.

[2] Appropriate work is shown, but two or more computational or rounding errors are made.

or

[2] Appropriate work is shown, but one conceptual error is made.

or

[2] Appropriate work is shown to find 11,524, but no further correct work is shown.

or

[2] A correct explanation is written, but no further correct work is shown.

[1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.

or

[1] 11,524, but no work is shown, and the explanation is incorrect or missing.

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(35) **[4]** A correct interval such as (0.625, 0.965), and correct work is shown, a positive response is indicated, and a correct explanation is written.

[3] Appropriate work is shown, but one computational error is made.

or

[3] Appropriate work is shown to find (0.625, 0.965), but the explanation is incomplete.

[2] Appropriate work is shown, but two or more computational errors are made.

or

[2] Appropriate work is shown, but one conceptual error is made.

or

[2] Appropriate work is shown to find (0.625, 0.965), but no further correct work is shown.

[1] Appropriate work is shown, but one conceptual and one computational error are made.

or

[1] A positive response is indicated, but the explanation does not refer to the interval.

or

[1] (0.625, 0.965) is written, but no work is shown.

[0] A positive response is indicated, but no explanation is written.

or

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(36) **[4]** A correct graph of $f(x)$ is drawn and asymptote of $f(x)$ is $x = 1$ and asymptote of $g(x)$ is $y = 1$.

[3] Appropriate work is shown, but one computational or graphing error is made.

[2] Appropriate work is shown, but two or more computational or graphing errors are made.

or

[2] Appropriate work is shown, but one conceptual error is made.

or

[2] A correct graph is drawn, but no further correct work is shown.

or

[2] The two asymptotes are stated correctly, but no further correct work is shown.

[1] Appropriate work is shown, but one conceptual and one computational or graphing error are made.

or

[1] Only one correct asymptote is stated.

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

Part IV

For this question, use the specific criteria to award a maximum of 6 credits. Unless otherwise specified, mathematically correct alternative solutions should be awarded appropriate credit.

(37) **[6]** 0.958, 88, 3.3, and correct work is shown.

[5] Appropriate work is shown, but one computational or rounding error is made.

[4] Appropriate work is shown, but one conceptual error is made.

or

[4] Appropriate work is shown, but two or more rounding errors are made.

or

[4] Appropriate work is shown, but two computational errors are made.

[3] Appropriate work is shown, but three or more computational errors are made.

or

[3] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.

or

[3] 0.958, 88, and 3.3, but no work is shown.

[2] Appropriate work is shown, but one conceptual error and two computational or rounding errors are made.

or

[2] Appropriate work is shown, but two conceptual errors are made.

or

[2] Appropriate work is shown to find 0.958, but no further correct work is shown.

or

[2] Appropriate work is shown to find 88, but no further correct work is shown.

or

[2] Appropriate work is shown to find 3.3, but no further correct work is shown.

[1] Appropriate work is shown, but two conceptual errors and one computational or rounding error are made.

or

[1] 0.958 or 88 or 3.3, but no work is shown.

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

Map to the Learning Standards
Algebra II
June 2024

Question	Type	Credits	Cluster
1	Multiple Choice	2	A-SSE.A
2	Multiple Choice	2	A-REI.D
3	Multiple Choice	2	F-IF.C
4	Multiple Choice	2	A-REI.C
5	Multiple Choice	2	A-APR.C
6	Multiple Choice	2	S-ID.B
7	Multiple Choice	2	A-SSE.A
8	Multiple Choice	2	A-REI.A
9	Multiple Choice	2	N-CN.C
10	Multiple Choice	2	A-REI.B
11	Multiple Choice	2	F-BF.A
12	Multiple Choice	2	F-BF.A
13	Multiple Choice	2	N-RN.A
14	Multiple Choice	2	A-APR.B
15	Multiple Choice	2	A-SSE.B
16	Multiple Choice	2	S-CP.B
17	Multiple Choice	2	F-TF.C
18	Multiple Choice	2	S-ID.A
19	Multiple Choice	2	F-BF.B
20	Multiple Choice	2	A-APR.B

21	Multiple Choice	2	F-BF.A
22	Multiple Choice	2	A-APR.D
23	Multiple Choice	2	G-GPE.A
24	Multiple Choice	2	A-SSE.B
25	Constructed Response	2	N-CN.A
26	Constructed Response	2	F-LE.A
27	Constructed Response	2	S-IC.B
28	Constructed Response	2	F-IF.C
29	Constructed Response	2	F-IF.B
30	Constructed Response	2	A-REI.A
31	Constructed Response	2	S-CP.A
32	Constructed Response	2	F-BF.B
33	Constructed Response	4	A-REI.C
34	Constructed Response	4	F-IF.B
35	Constructed Response	4	S-IC.B
36	Constructed Response	4	F-IF.C
37	Constructed Response	6	A-SSE.B

Regents Examination in Algebra II

June 2024

Chart for Converting Total Test Raw Scores to Final Examination Scores (Scale Scores)

The *Chart for Determining the Final Examination Score for the June 2024 Regents Examination in Algebra II* will be posted on the Department's web site at: https://www.nysed.gov/state-assessment/high-school-regents-examinations by Monday, June 24, 2024. Conversion charts provided for previous administrations of the Regents Examination in Algebra II must NOT be used to determine students' final scores for this administration.

Online Submission of Teacher Evaluations of the Test to the Department

Suggestions and feedback from teachers provide an important contribution to the test development process. The Department provides an online evaluation form for State assessments. It contains spaces for teachers to respond to several specific questions and to make suggestions. Instructions for completing the evaluation form are as follows:

1. Go to https://www.nysed.gov/state-assessment/teacher-feedback-state-assessments.

2. Select the test title.

3. Complete the required demographic fields.

4. Complete each evaluation question and provide comments in the space provided.

5. Click the SUBMIT button at the bottom of the page to submit the completed form.

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

ALGEBRA II

Monday, June 24, 2024 — 9:15 a.m. to 12:15 p.m., only

MODEL RESPONSE SET

Table of Contents

Question 25

25 Given x is a real number, write the expression in simplest $a + bi$ form:

$$(x + 2i)(3 - 2xi) + 2x^2i$$

$3x - 2x^2i + 6i - 4xi^2 + 2x^2i$

$3x + 6i - 4xi^2$

$3x + 6i + 4x$

$7x + 6i$

$i^1 = i$

$i^2 = -1$

$i^3 = -i$

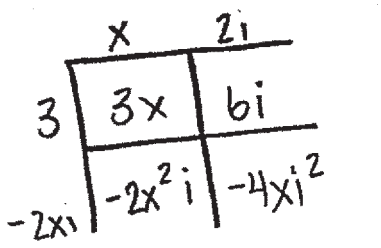
$i^4 = 1$

Score 2: The student gave a complete and correct response.

Question 25

25 Given x is a real number, write the expression in simplest $a + bi$ form:

$$(x + 2i)(3 - 2xi) + 2x^2i$$



$3x + 6i - 2x^2i + 4x$

$7x - 2x^2i + 6i - 2x^2i$

$6i + 7x$

Score 2: The student gave a complete and correct response.

Question 25

25 Given x is a real number, write the expression in simplest $a + bi$ form:

$(x + 2i)(3 - 2xi) + 2x^2i$

$3x - 2x^2i + 6i - 4xi^2 + 2x^2i$

$3x + 6i - 4xi^2$

Score 1: The student did not express the result in simplest $a + bi$ form.

Question 25

25 Given x is a real number, write the expression in simplest $a + bi$ form:

$$(x + 2i)(3 - 2xi) + 2x^2i$$

#7

$3x - 2x^2i + 6i - 4xi^2 + 2x^2i$

$3x + 6i - 4xi^2$

$3x + 6i - 4x$

$-x + 6i$

Score 1: The student incorrectly evaluated i^2.

Question 25

25 Given x is a real number, write the expression in simplest $a + bi$ form:

$$(x + 2i)(3 - 2xi) + 2x^2i$$

$3x - 2x^2 + 6i + 2xi^2 + 2x^2$

$3x + 6i - 2xi^2$

$1 + 7i^3$

Score 0: The student made multiple errors.

Question 25

25 Given x is a real number, write the expression in simplest $a + bi$ form:

$$(x + 2i)(3 - 2xi) + 2x^2i$$

$(5+2i)(3-2(5)i)+2(5)^2i$;

$35-44i+2(5)^2i$

$35-44i+50i$

$35+6i$

Score 0: The student did not show enough relevant course-level work to receive any credit by evaluating the expression for $x = 5$.

Question 26

26 Solve $3.8e^{1.5t} = 16$ algebraically for t to the *nearest hundredth*.

$\frac{3.8e^{1.5t}}{3.8} = \frac{16}{3.8}$

$e^{1.5t} = 4.210526316$

$\ln e^{1.5t} = \ln 4.210526316$

$\frac{1.5t \ln e}{\ln e} = \frac{\ln 4.210526316}{\ln e}$

$\frac{1.5t}{1.5} = \frac{1.437587656}{1.5}$

$t = 0.96$

Score 2: The student gave a complete and correct response.

Question 26

26 Solve $3.8e^{1.5t} = 16$ algebraically for t to the *nearest hundredth*.

$\frac{3.8e^{1.5t}}{3.8} = \frac{16}{3.8}$

$e^{1.5t} = 4.210526316$

$\frac{1.5t \ln e}{1.5} = \frac{\ln 4.210526316}{1.5}$

$= .95839$

$\approx \boxed{.96}$

Score 2: The student gave a complete and correct response.

Question 26

26 Solve $3.8e^{1.5t} = 16$ algebraically for t to the *nearest hundredth*.

$3.8e^{1.5t} = 16$

$\frac{\ln 3.8e^{1.5t}}{\ln 3.8} = \frac{\ln 16}{\ln 3.8}$

$e^{1.5t} = 2.07684$

$\ln e^{1.5t} = \ln 2.07684$

$\frac{1.5t \ln e}{1.5} = \frac{\ln 2.07684}{1.5}$

$t = 0.487232$

$t = 0.49$

Score 1: The student incorrectly applied the natural log.

Question 26

26 Solve $3.8e^{1.5t} = 16$ algebraically for t to the *nearest hundredth*.

$3.8e^{1.5(t)} = 16$

$3.8e^{1.5(2)} = 76.325$

$3.8e^{1.5(1)} = 17.03041$

$3.8e^{1.5(.9)} = 14.658$

$3.8e^{1.5(.959)} = 16.014$

$t \approx .96$

Score 1: The student used a method other than algebraic.

Question 26

26 Solve $3.8e^{1.5t} = 16$ algebraically for t to the *nearest hundredth*.

$\frac{16}{3.8} = \frac{3.8e^{1.5t}}{3.8}$

$4.21 = e^{1.5t}$

$t = 1.03$

Score 0: The student did not show enough relevant course-level work to receive any credit.

Question 26

26 Solve $3.8e^{1.5t} = 16$ algebraically for t to the *nearest hundredth*.

$$1.5t \frac{\log 3.8}{\log 3.8} = \frac{\log 16}{\log 3.8}$$

$$1.5t = 2.07$$

Score 0: The student incorrectly applied the logarithm and did not solve for t.

Question 27

27 In an attempt to get the student body's opinion of a new dress code, members of the statistics class surveyed the students of the first period computer science class. Explain a statistical bias in the method of data collection.

One statistical bias is surveying students of a first period class. This is because one class in the morning does not represent every student as people can have different schedules

Score 2: The student gave a complete and correct response.

Question 27

27 In an attempt to get the student body's opinion of a new dress code, members of the statistics class surveyed the students of the first period computer science class. Explain a statistical bias in the method of data collection.

The people who take Computer Science might all have similar opinions and in order to obtain better results they would need to ask different types of classes.

Score 2: The student gave a complete and correct response.

Question 27

27 In an attempt to get the student body's opinion of a new dress code, members of the statistics class surveyed the students of the first period computer science class. Explain a statistical bias in the method of data collection.

They only collect data from computer science class.

Score 1: The student did not sufficiently explain the bias.

Question 27

27 In an attempt to get the student body's opinion of a new dress code, members of the statistics class surveyed the students of the first period computer science class. Explain a statistical bias in the method of data collection.

The surveyors only surveyed one class which most likely does not take up even half of the student body. There was no randomness.

Score 1: The student gave an incomplete explanation of the bias.

Question 27

27 In an attempt to get the student body's opinion of a new dress code, members of the statistics class surveyed the students of the first period computer science class. Explain a statistical bias in the method of data collection.

the survey taken was not on a large enogh scale

Score 0: The student did not satisfy the criteria for one or more credits.

Question 27

27 In an attempt to get the student body's opinion of a new dress code, members of the statistics class surveyed the students of the first period computer science class. Explain a statistical bias in the method of data collection.

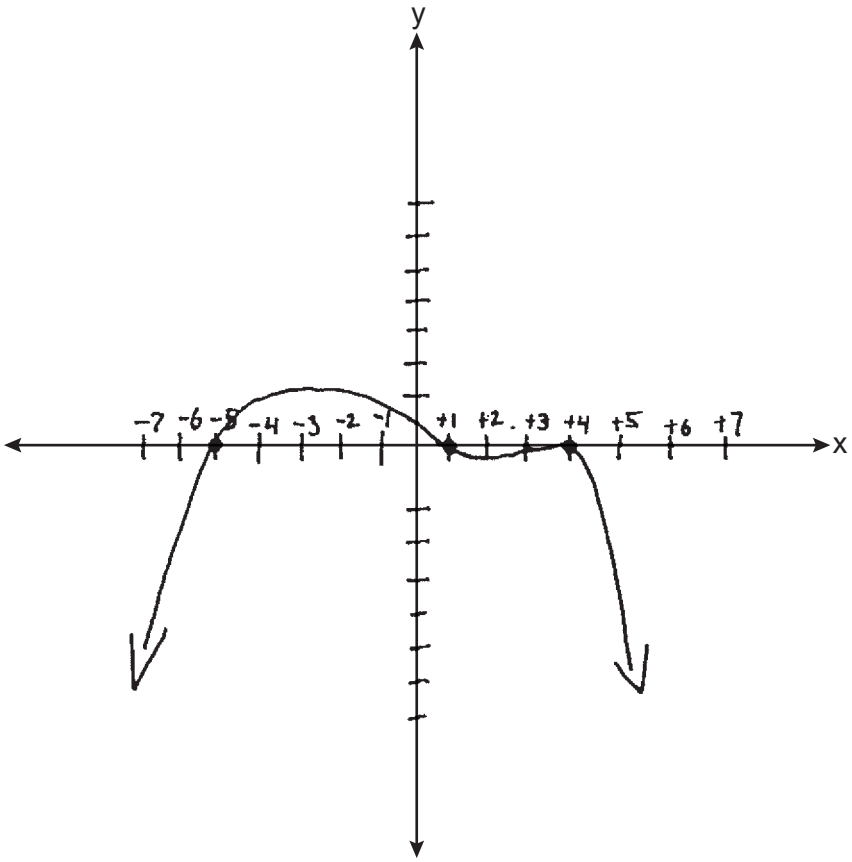
they went to find out how the first period class is dressed.

Score 0: The student did not show enough relevant course-level work to recieve any credit.

Question 28

28 Sketch a graph of polynomial $P(x)$, given the criteria below:

- $P(x)$ has zeros only at -5, 1, and 4
- As $x \to \infty$, $P(x) \to -\infty$
- As $x \to -\infty$, $P(x) \to -\infty$



Score 2: The student gave a complete and correct response.

Question 28

28 Sketch a graph of polynomial $P(x)$, given the criteria below:

- $P(x)$ has zeros only at -5, 1, and 4
- As $x \to \infty$, $P(x) \to -\infty$
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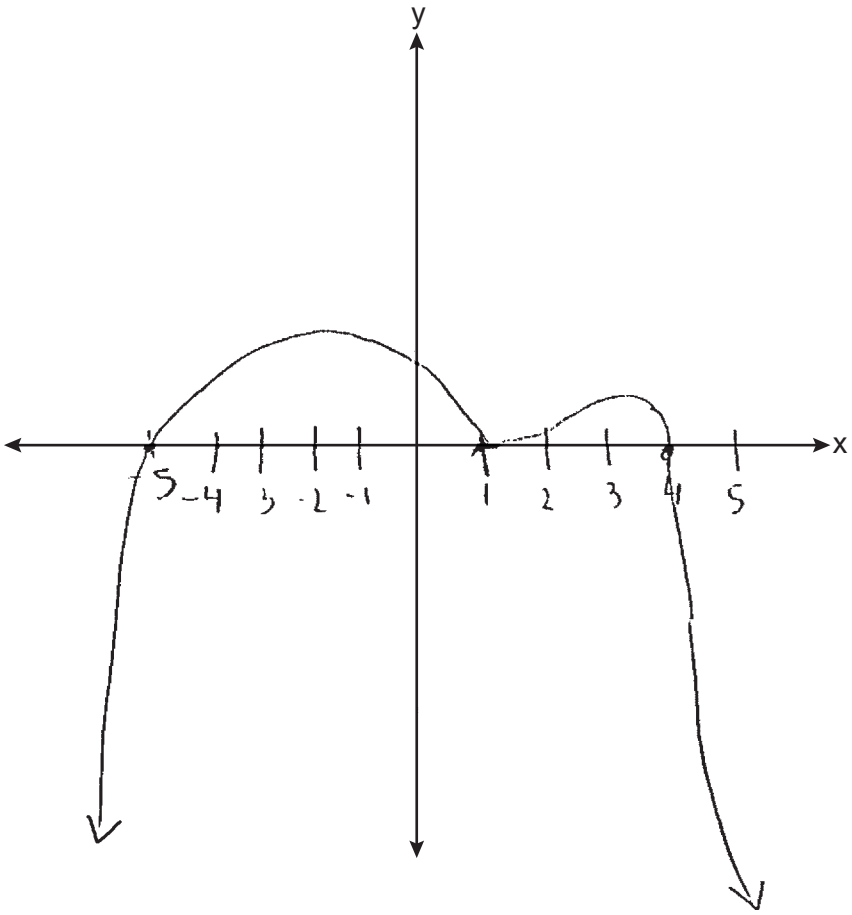


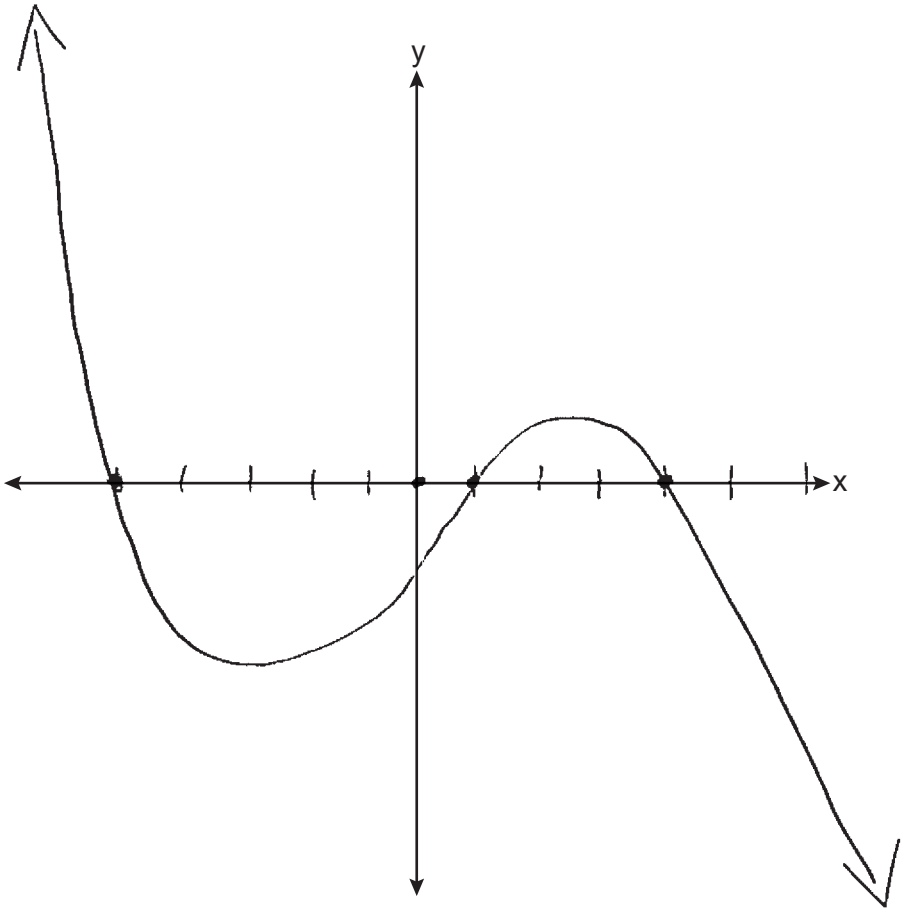
Score 2: The student gave a complete and correct response.

Question 28

28 Sketch a graph of polynomial $P(x)$, given the criteria below:

- $P(x)$ has zeros only at -5, 1, and 4
- As $x \to \infty$, $P(x) \to -\infty$
- As $x \to -\infty$, $P(x) \to -\infty$

x^3

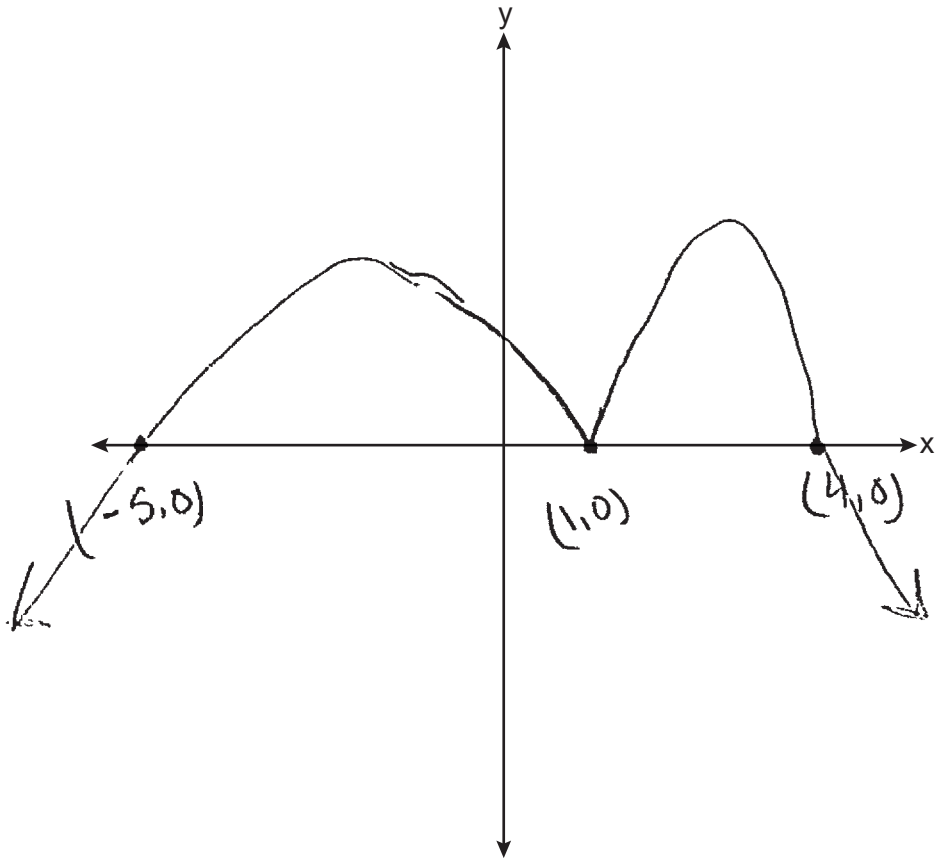


Score 1: The student incorrectly graphed the end behavior.

Question 28

28 Sketch a graph of polynomial $P(x)$, given the criteria below:

- $P(x)$ has zeros only at -5, 1, and 4
- As $x \to \infty$, $P(x) \to -\infty$
- As $x \to -\infty$, $P(x) \to -\infty$

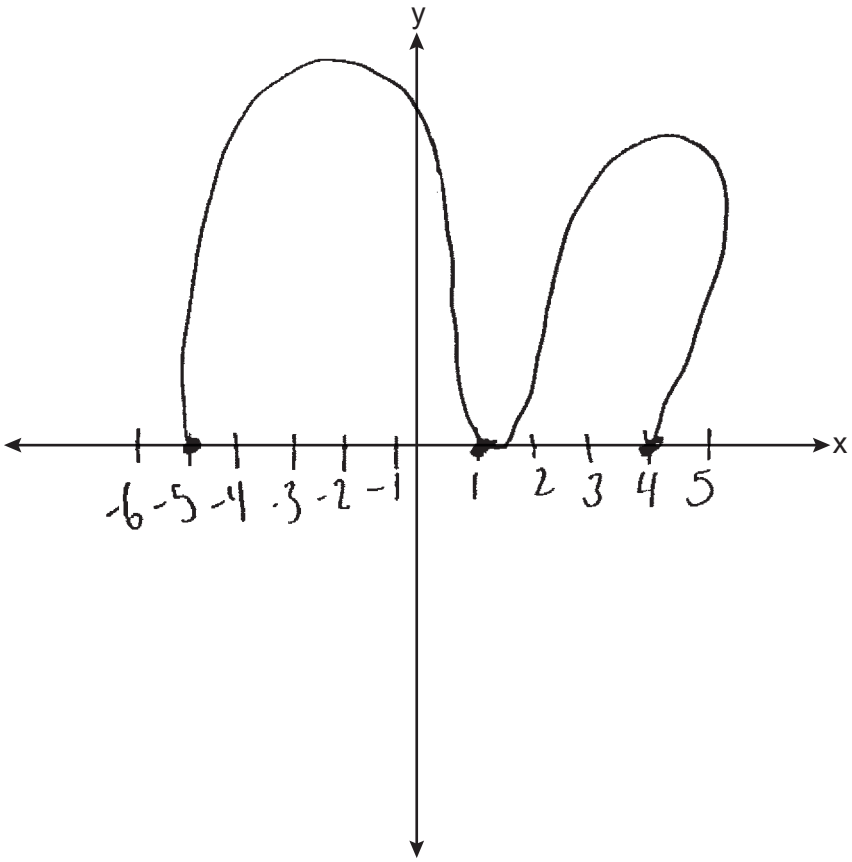


Score 1: The student did not graph a polynomial function.

Question 28

28 Sketch a graph of polynomial $P(x)$, given the criteria below:

- $P(x)$ has zeros only at -5, 1, and 4
- As $x \to \infty$, $P(x) \to -\infty$
- As $x \to -\infty$, $P(x) \to -\infty$

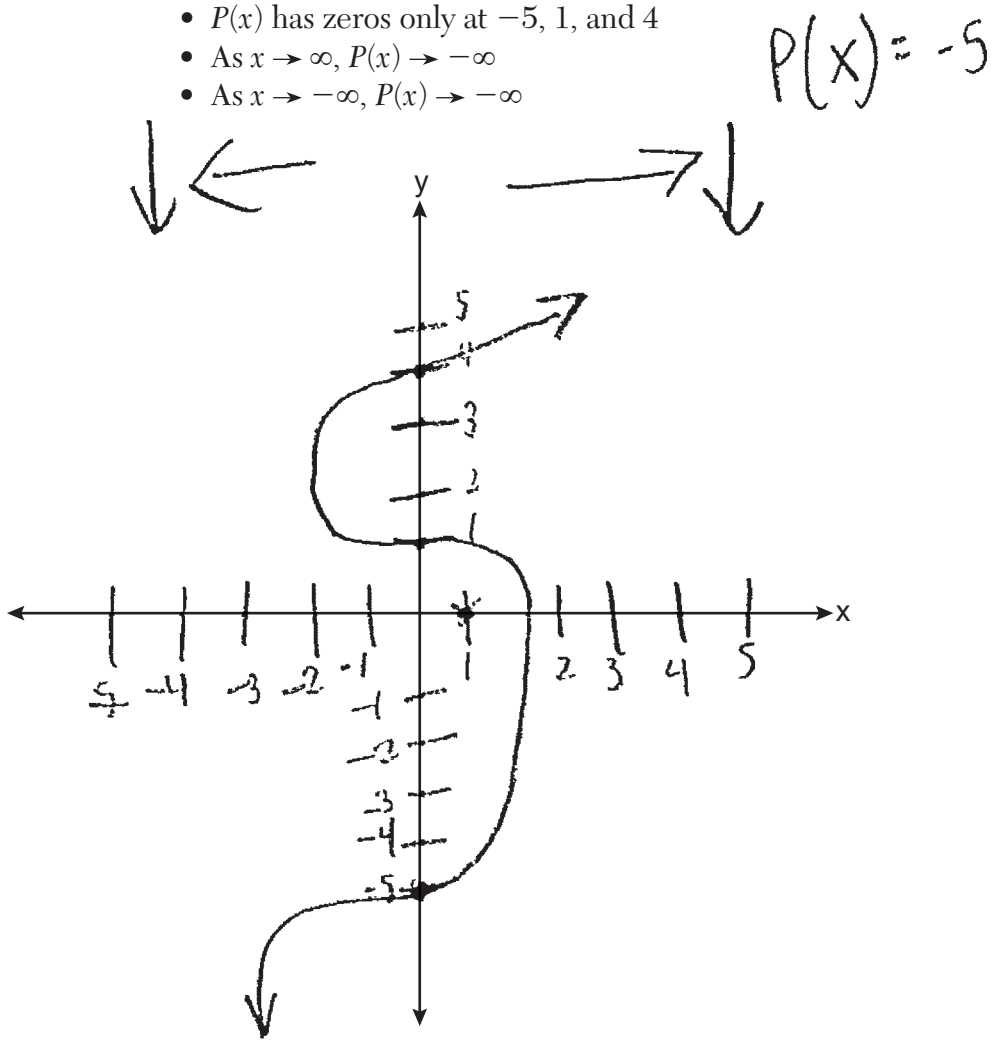


Score 0: The student made multiple graphing errors.

Question 28

28 Sketch a graph of polynomial $P(x)$, given the criteria below:

- $P(x)$ has zeros only at -5, 1, and 4
- As $x \to \infty$, $P(x) \to -\infty$
- As $x \to -\infty$, $P(x) \to -\infty$



Score 0: The student made multiple graphing errors.

Question 29

29 The height, above ground, of a Ferris wheel car can be modeled by the function $h(t) = -103.5\cos\left(\frac{2\pi t}{5}\right) + 108.5$ where h is measured in feet and t is measured in minutes. State the period of the function and describe what the period represents in this context.

$PB = 2\pi$

$\frac{\frac{2\pi}{5}P}{\frac{2\pi}{5}} = \frac{2\pi}{\frac{2\pi}{5}}$

$P = 5$

$\frac{2\pi}{1} \cdot \frac{5}{2\pi} = \frac{10\pi}{2\pi} = 5$

The period in this context is how long it takes for the ferris wheel to make one full rotation.

Score 2: The student gave a complete and correct response.

Question 29

29 The height, above ground, of a Ferris wheel car can be modeled by the function $h(t) = -103.5\cos\left(\frac{2\pi t}{5}\right) + 108.5$ where h is measured in feet and t is measured in minutes. State the period of the function and describe what the period represents in this context.

The period is 5 which means every 5 minutes the ferris wheel car will return to the bottom of the ride

Score 2: The student gave a complete and correct response.

Question 29

29 The height, above ground, of a Ferris wheel car can be modeled by the function $h(t) = -103.5\cos\left(\frac{2\pi t}{5}\right) + 108.5$ where h is measured in feet and t is measured in minutes. State the period of the function and describe what the period represents in this context.

the period represents how long it takes to go around the ferris wheel one time.

Score 1: The student did not state the period.

Question 29

29 The height, above ground, of a Ferris wheel car can be modeled by the function $h(t) = -103.5\cos\left(\frac{2\pi t}{5}\right) + 108.5$ where h is measured in feet and t is measured in minutes. State the period of the function and describe what the period represents in this context.

$$\frac{\frac{2\pi}{5}}{2}$$

the period represents how long it takes the ferris wheel to go around once

Score 1: The student stated the period incorrectly, but wrote a correct description.

Question 29

29 The height, above ground, of a Ferris wheel car can be modeled by the function $h(t) = -103.5\cos\left(\frac{2\pi t}{5}\right) + 108.5$ where h is measured in feet and t is measured in minutes. State the period of the function and describe what the period represents in this context.

$\frac{2\pi}{3}\left(\frac{2\pi}{5}\right)$

$\frac{2\pi}{3} \times \frac{5}{2\pi} = \frac{10\pi}{6\pi} = \frac{5}{3}$

Period $= \frac{5}{3}$

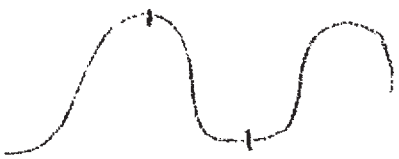
The period represents how many full cycles the function will take

Score 0: The student determined the period incorrectly and did not state the description in context.

Question 29

29 The height, above ground, of a Ferris wheel car can be modeled by the function $h(t) = -103.5\cos\left(\frac{2\pi t}{5}\right) + 108.5$ where h is measured in feet and t is measured in minutes. State the period of the function and describe what the period represents in this context.

The period is $\frac{2\pi}{5}$ which represents the amount of time it takes for a certain part on the ferris wheel to reach the top from the bottom ⇒ one full cycle



Score 0: The student stated the period incorrectly and wrote an incorrect description.

Question 30

30 Solve algebraically for all values of x: $x(x+5)$ $x(x+5)$ $x(x+5)$

$$\frac{8}{x+5} - \frac{3}{x} = 5$$

$8x - 3x - 15 = 5x^2 + 25x$

$-5x + 15 \quad -5x + 15$

$0 = 5x^2 + 20x + 15$

$0 = 5(x^2 + 4x + 3)$

$0 = 5(x^2 + 3x + x + 3)$

$5 \mid x(x+3) \mid 1(x+3)$

$5 \neq 0 \quad x+1=0 \quad x+3=0$

$x = -1 \quad x = -3$

Score 2: The student gave a complete and correct response.

Question 30

30 Solve algebraically for all values of x:

$$\frac{x}{x}\cdot\frac{8}{x+5}-\frac{3}{x}\cdot\frac{x+5}{x+5}=5$$

$$\frac{8x-3x-15}{x^2+5x}=\frac{5}{1}$$

$$5x^2+25x=5x-15$$

$$5x^2+20x+15=0$$

$$5(x^2+4x+3)=0$$

$$5(x+3)(x+1)=0$$

$$\boxed{x=-3,-1}$$

$\frac{8}{2}-\frac{3}{-3}=5$

$4+1=5$

$5=5$ ✓

$\frac{8}{4}-\frac{3}{-1}=5$

$2+3=5$

$5=5$ ✓

Score 2: The student gave a complete and correct response.

Question 30

30 Solve algebraically for all values of x:

$(x)\ \frac{8}{x+5} - \frac{3}{x} = \frac{5}{1}\ (x+5)(x)(x+15)$

$5x(x+15)$

$5(x^2+5x)$

$8x - 3x - 15 = 5x^2 + 25x$

$-8x + 3x + 15$

$5x^2 + 20x + 15 = 0$

$8 - 3 - 5$

$p\ 4 \leq 1$

$5\ 3$

Score 1: The student found a correct quadratic equation in standard form.

Question 30

30 Solve algebraically for all values of x:

$$\frac{8}{x+5} - \frac{3}{x} = 5$$

$\frac{8}{x+5} - \frac{3}{x} - 5$

$x+1=0$ $\quad$ $x+3=0$

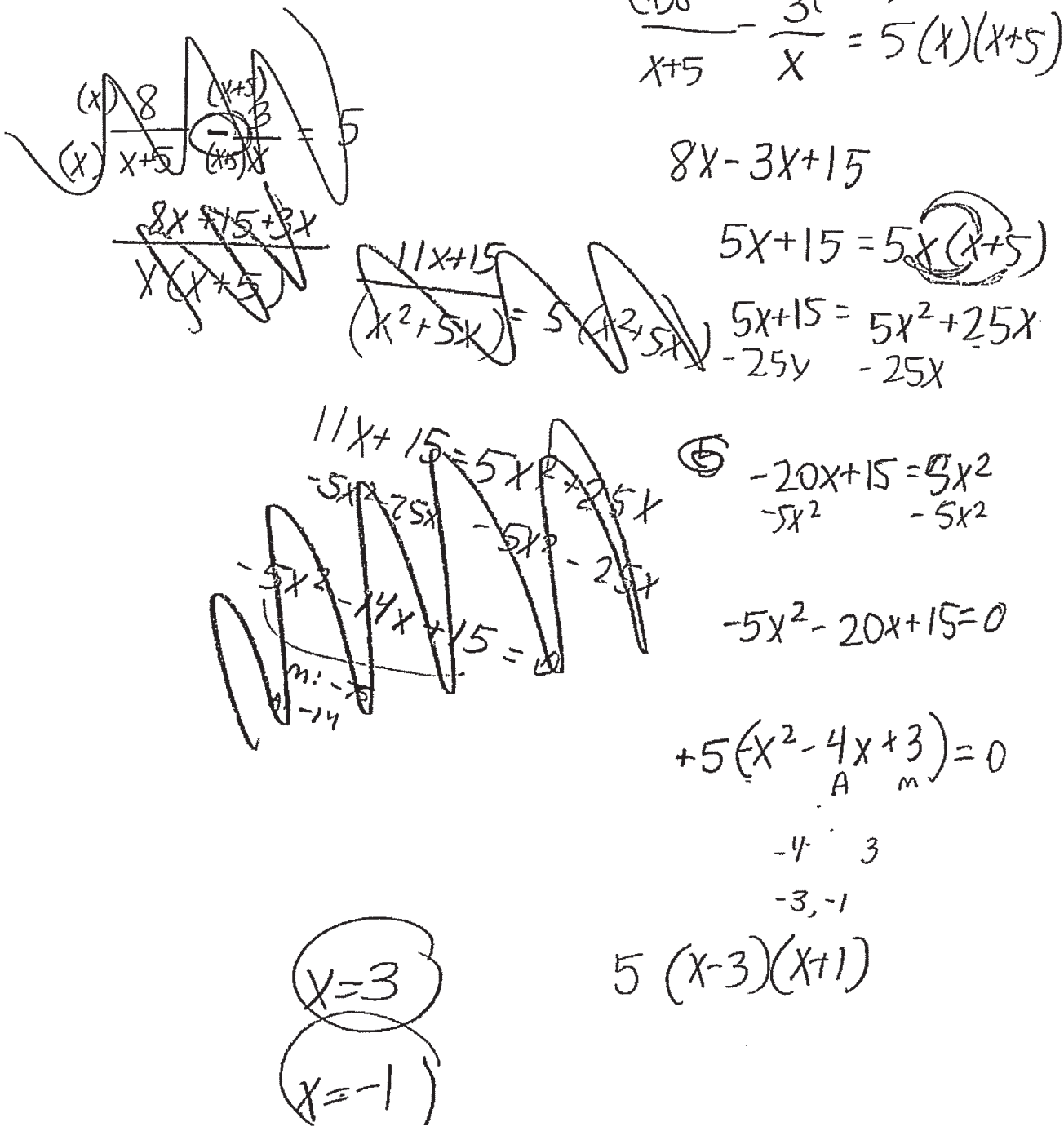
$x=-1$ $\quad$ $x=-3$

Score 1: The student stated the correct values for x, but showed insufficient algebraic work.

Question 30

30 Solve algebraically for all values of x:

$$\frac{8}{x+5} - \frac{3}{x} = 5$$



Score 0: The student made multiple errors.

Question 30

30 Solve algebraically for all values of x:

$$\frac{8}{x+5} - \frac{3}{x} = 5$$

$\frac{8(x)}{x+5(x)} - \frac{3(x+5)}{x(x+5)} = \frac{5(x)(x+5)}{1(x)(x+5)}$

$\frac{8x-3(x-5)}{(x+5)(x)} = \frac{5x(x+5)}{(x)(x+5)}$

$8x-3(x+5)$

$8x-3x+15 = 5x^2+25x$

$5x+15 = 5x^2+25x$

$-25x \qquad -25x$

$-20x+15 = 5x^2$

$-5x^2 \qquad -5x^2$

$= 5x^2-20x+15$

$-x^2-4x+3$

$5(x+4)(x-1)$

$x=-4$

$x=1$

Score 0: The student made multiple errors.

Question 31

31 The transportation methods used by the upperclassmen at Calhoun High School are summarized in the table below.

Upperclassmen Transportation Methods

	Drive	Take the Bus	Walk
Junior	58	75	12
Senior	81	39	12

277

Are the events "being a junior" and "driving to school" independent? Using statistical evidence, justify your answer.

P(J) = 145/277 p(J) = .523

P(J|d) = 58/139 P(J|d) = .417

NO, theyre not independent bc

.523 ≠ .417

Score 2: The student gave a complete and correct response.

Question 31

31 The transportation methods used by the upperclassmen at Calhoun High School are summarized in the table below.

Upperclassmen Transportation Methods

	Drive	Take the Bus	Walk	
Junior	58	75	12	145
Senior	81	39	12	132
	139	114	24	277

Are the events "being a junior" and "driving to school" independent? Using statistical evidence, justify your answer.

$P(\text{Junior and drive}) \stackrel{?}{=} P(\text{Junior}) \times P(\text{drive})$

$\frac{58}{277} \stackrel{?}{=} \frac{145}{277} \times \frac{139}{277}$

$.209 \neq .263$

No, the events "being a junior" & "driving to school" are not independent events, because P(Junior & drive) does not equal P(Junior) x P(drive).

Score 2: The student gave a complete and correct response.

Question 31

31 The transportation methods used by the upperclassmen at Calhoun High School are summarized in the table below.

Upperclassmen Transportation Methods

	Drive	Take the Bus	Walk
Junior	58	75	12
Senior	81	39	12

277 students

Are the events "being a junior" and "driving to school" independent? Using statistical evidence, justify your answer.

$P(A \cap B) = P(A) \cdot P(B)$

$\frac{58}{277} = \frac{145}{277} \cdot \frac{139}{277}$

$.2095486116 \neq .2154335586$

dependent

Score 1: The student found the probability of taking a bus rather than the probability of driving to school.

Question 31

31 The transportation methods used by the upperclassmen at Calhoun High School are summarized in the table below.

Upperclassmen Transportation Methods

	Drive	Take the Bus	Walk	T
Junior	58	75	12	145
Senior	81	39	12	132
T	139	114	24	277

Are the events "being a junior" and "driving to school" independent? Using statistical evidence, justify your answer.

$P(J \cup D) = P(J) \cdot P(D)$

$P(J \cup D) = P(J) + P(D) - P(J \cap D)$

$P(J \cup D) = \frac{146}{277} + \frac{139}{277} - \frac{58}{277}$

$P(J \cup D) = \frac{226}{277}$

$\frac{226}{277} = \frac{145}{277} \cdot \frac{139}{277}$

$.815884476 \neq .262677359$

No, they are not independent.

Score 1: The student used an incorrect method for proving independence.

Question 31

31 The transportation methods used by the upperclassmen at Calhoun High School are summarized in the table below.

Upperclassmen Transportation Methods

	Drive	Take the Bus	Walk	Total
Junior	58	75	12	145
Senior	81	39	12	132
Total	139	114	24	554

Are the events "being a junior" and "driving to school" independent? Using statistical evidence, justify your answer.

$\frac{145}{554} = .261732852$

$\frac{139}{554}$ .250902711

They are independent because they have different probabilities which means that they do not happen together.

Score 0: The student did not show enough relevant course-level work to receive any credit.

Question 31

31 The transportation methods used by the upperclassmen at Calhoun High School are summarized in the table below.

Upperclassmen Transportation Methods

	Drive	Take the Bus	Walk	
Junior	58	75	12	145
Senior	81	39	12	132
	139	114	24	277

Are the events "being a junior" and "driving to school" independent? Using statistical evidence, justify your answer.

A|B = 145/277 = 0.523

139/277 = 0.502

Not equal independent

Score 0: The student did not show enough relevant course-level work to receive any credit.

Question 32

32 Can $f(x) = x^3 + 7$ be classified as an odd function? Justify your answer.

$f(-x) = (-x)^3 + 7$

$-f(x) = -(x^3 + 7)$

$-f(x) = -x^3 - 7$

$f(x) = x^3 + 7$ can not be classified as an odd function because $f(-x) \neq -f(x)$

Score 2: The student gave a complete and correct response.

Question 32

32 Can $f(x) = x^3 + 7$ be classified as an odd function? Justify your answer.

$f(-x) = (-x)^3 + 7$

$f(-x) = -x^3 + 7$

f(x) cannot be classified as odd because when negative x is plugged in, the formula is not the same or opposite of the regular formula, so it is neither even nor odd.

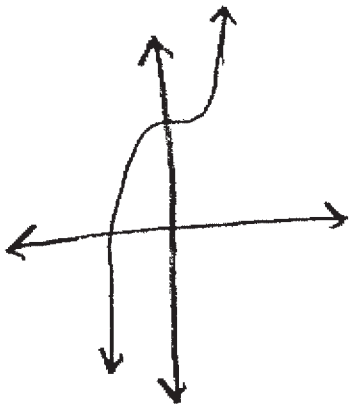
Score 2: The student gave a complete and correct response.

Question 32

32 Can $f(x) = x^3 + 7$ be classified as an odd function? Justify your answer.

$f(x) = x^3 + 7$

No, it is not an odd function b/c it does not rotate 180°



Score 1: The student wrote an incomplete justification.

Question 32

32 Can $f(x) = x^3 + 7$ be classified as an odd function? Justify your answer.

Yes. Because the exponent is odd (3) and 7 is odd.

Score 0: The student did not satisfy the criteria for one or more credits.

Question 32

32 Can $f(x) = x^3 + 7$ be classified as an odd function? Justify your answer.

NO, because the ~~ye~~ y-intercept is at a positive 7, and it increases, it doesn't decrease at all, ~~[illegible]~~

(-∞, +∞)

Score 0: The student provided an incorrect justification.

Question 33

33 Solve the following system of equations algebraically for all values of x, y, and z:

$$3x - 8y + 2z = -60$$
$$2x - 7y - 5z = -31$$
$$-6x + 2y - 4z = 36$$

$-6x + 16y - 4z = 120$
$6x - 21y - 15z = -93$
$-5y - 19z = 27$

$6x - 16y + 4z = -120$
$-6x + 2y - 4z = 36$
$-14y = -84$
$y = 6$

$-5(6) - 19z = 27$
$-30 - 19z = 27$
$-19z = 57$
$z = -3$

$3x - 8(6) + 2(-3) = -60$
$3x - 48 - 6 = -60$
$3x - 54 = -60$
$3x = -6$
$x = -2$

Score 4: The student gave a complete and correct response.

Question 33

33 Solve the following system of equations algebraically for all values of x, y, and z:

$2(3x - 8y + 2z = -60)$
$-3(2x - 7y - 5z = -31)$
$-6x + 2y - 4z = 36$

$6x - 16y + 4z = -120$
$-6x + 21y + 15z = 93$
$5y + 19z = -27$

$-14y = -84$
-14
$y = 6$

$5(6) + 19z = -27$
$30 + 19z = -27$
$-30 \quad -30$
$19z = -57$
19
$z = 3$

$-6x + 2(6) - 4(3) = 36$
$-6x + 12 - 12 = 36$
$-6x = 36$
-6
$x = -6$

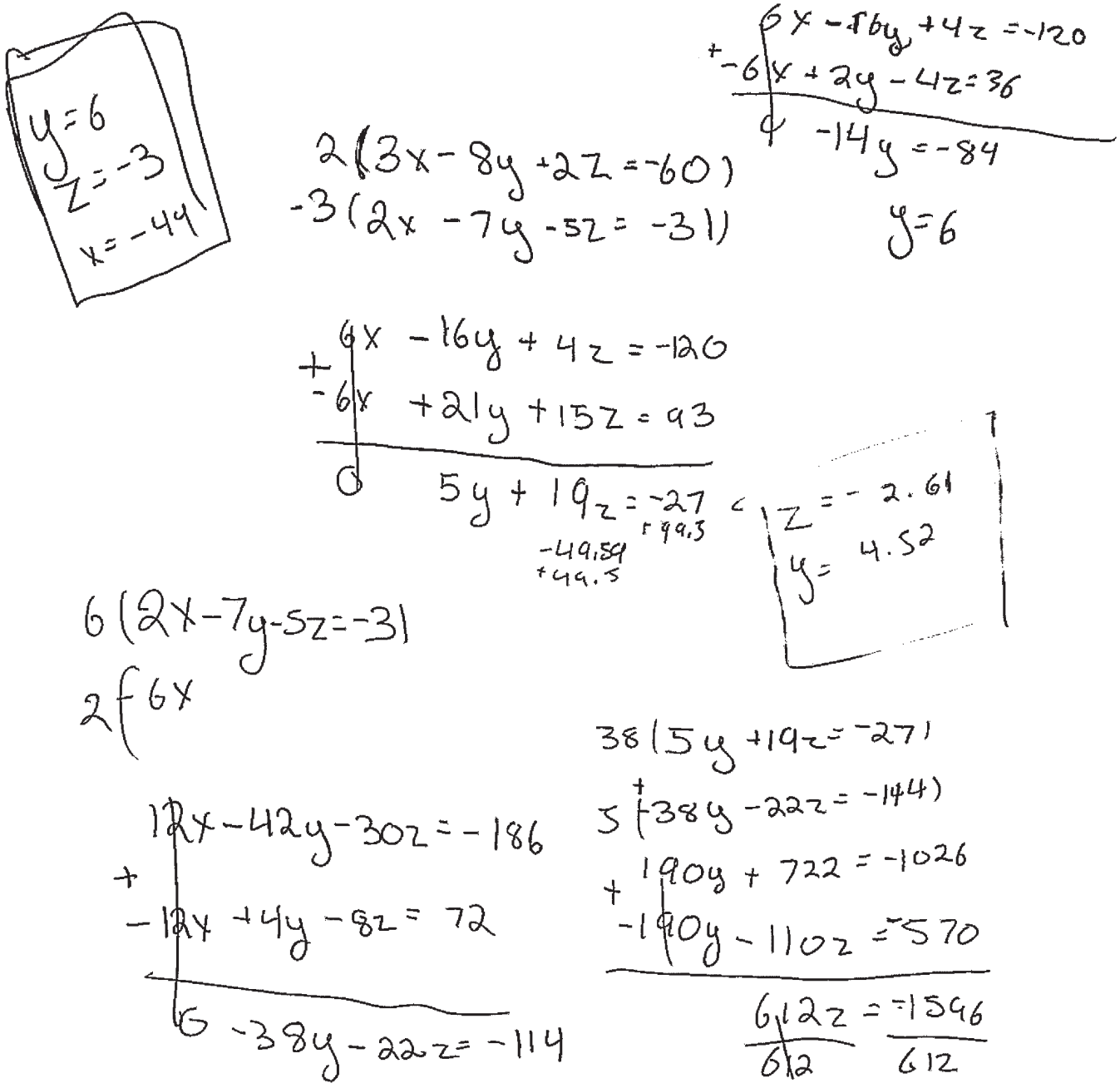
$x = -6$
$y = 6$
$z = 3$

Score 3: The student made an error solving for z.

Question 33

33 Solve the following system of equations algebraically for all values of x, y, and z:

$$3x - 8y + 2z = -60$$
$$2x - 7y - 5z = -31$$
$$-6x + 2y - 4z = 36$$



Score 2: The student correctly found one value.

Question 33

33 Solve the following system of equations algebraically for all values of x, y, and z:

$$\begin{cases} 3x - 8y + 2z = -60 \\ 2x - 7y - 5z = -31 \\ -6x + 2y - 4z = 36 \end{cases}$$

3 -8 2 -60
2 -7 -5 -31
-6 2 -4 36

1 0 0 -2
0 1 0 6
0 0 1 -3

x = -2
y = 6
z = -3

Score 2: The student used a method other than algebraic.

Question 33

33 Solve the following system of equations algebraically for all values of x, y, and z:

$$3x - 8y + 2z = -60$$
$$2x - 7y - 5z = -31$$
$$-6x + 2y - 4z = 36$$

X=-2
Y=6
Z=-3

3x-8(6)+2Z=-60
-6x+2y-4Z=36
+24x-8y+16Z=144

Score 1: The student found the correct answer with no supporting work.

Question 33

33 Solve the following system of equations algebraically for all values of x, y, and z:

$$3x - 8y + 2z = -60$$
$$2x - 7y - 5z = -31$$
$$-6x + 2y - 4z = 36$$

(3) $2x - 7y - 5z = 31$
$-6x + 2y - 4z = 36$

$6x - 21y - 15z = -93$
$-6x + 2y - 4z = 36$

$-19y - 19z = -57$

(2) $3x - 8y + 2z = -60$
$-6x + 2y - 4z = 36$

$6x - 8y + 2z = -120$
$-6x + 2y - 4z = 36$

$-6y - 2z = -84$

Score 0: The student created an incorrect system of equations with two variables.

Question 34

34 In the town of Skaneateles, New York, house prices since 2008 have changed based on the function $H(t) = 200{,}000(1.045)^t$, where t is the number of years since 2008 and $H(t)$ is the median house price. Determine the average rate of change for the median house price in Skaneateles from 2010 to 2018 to the *nearest dollar per year*.

2 → 218405

10 → 310593.88437

0 = 2008
2 = 2010
10 = 2018

$\frac{310593.88437 - 218405}{10 - 2} = \frac{92188.88435}{8}$

$11524/yr

Explain what this rate of change means as it relates to median house prices.

On average, median house prices increase at a rate of 11524 per year for 2010-2018

Score 4: The student gave a complete and correct response.

Question 34

34 In the town of Skaneateles, New York, house prices since 2008 have changed based on the function $H(t) = 200{,}000(1.045)^t$, where t is the number of years since 2008 and $H(t)$ is the median house price. Determine the average rate of change for the median house price in Skaneateles from 2010 to 2018 to the *nearest dollar per year*.

$$\frac{200000(1.045)^{10} - [200000(1.045)^2]}{2018 - 2010} = \frac{92188.9}{8}$$

$$\approx \$ 11524$$

Explain what this rate of change means as it relates to median house prices.

Between 2010 and 2018, house prices have risen by aproximitely 11524 dollars per year.

Score 4: The student gave a complete and correct response.

Question 34

34 In the town of Skaneateles, New York, house prices since 2008 have changed based on the function $H(t) = 200{,}000(1.045)^t$, where t is the number of years since 2008 and $H(t)$ is the median house price. Determine the average rate of change for the median house price in Skaneateles from 2010 to 2018 to the *nearest dollar per year*.

$H(2) = 200{,}000(1.045)^2$
$= 200{,}000(1.092025)$
$= 218{,}405$

$H(10) = 200{,}000(1.045)^{10}$
$= 200{,}000(1.552969422)$
$= 310{,}593.8843$

$ROC = \frac{\text{final} - \text{initial}}{\text{final} - \text{initial}}$
$= \frac{310{,}593.8843 - 21}{2018 - 201}$
$= \frac{92188.8843}{8}$
$= \$11523.610$
$\approx \$11524$ per year

Explain what this rate of change means as it relates to median house prices.

This rate of change means that house prices have been increasing at an average of 11,524 dollars per year in Skaneateles.

Score 3: The student omitted the time frame 2010 to 2018.

Question 34

34 In the town of Skaneateles, New York, house prices since 2008 have changed based on the function $H(t) = 200{,}000(1.045)^t$, where t is the number of years since 2008 and $H(t)$ is the median house price. Determine the average rate of change for the median house price in Skaneateles from 2010 to 2018 to the *nearest dollar per year*.

$H(10) = 200{,}000(1.045)^{10} = 310{,}594$

$H(0) = 200{,}000(1.045)^0 = 200{,}000$

$AROC = \frac{H(10) - H(0)}{10 - 0}$ $AROC = \frac{310{,}594 - 200{,}000}{10}$

$AROC = 11{,}059$

Explain what this rate of change means as it relates to median house prices.

This rate of change represents the average increase in price for the median house price in Skaneateles, NY from the year 2008-2018.

Score 3: The student calculated average rate of change using 2008.

Question 34

34 In the town of Skaneateles, New York, house prices since 2008 have changed based on the function $H(t) = 200{,}000(1.045)^t$, where t is the number of years since 2008 and $H(t)$ is the median house price. Determine the average rate of change for the median house price in Skaneateles from 2010 to 2018 to the *nearest dollar per year*.

8 years

2008 - 2018 = 10 years

$H(10) = 200000(1.045)^{10}$

$= 310593.88$

$H(2) = 200000(1.045)^2$

$= 218405$

$310594.88 - 218405 = 92189$

$\frac{92189}{8} = 11486$

$\$11486$

Explain what this rate of change means as it relates to median house prices.

As each year passes, the house price in Skaneateles increases by $11486

Score 2: The student incorrectly calculated the average rate of change and wrote an incomplete explanation.

Question 34

34 In the town of Skaneateles, New York, house prices since 2008 have changed based on the function $H(t) = 200{,}000(1.045)^t$, where t is the number of years since 2008 and $H(t)$ is the median house price. Determine the average rate of change for the median house price in Skaneateles from 2010 to 2018 to the *nearest dollar per year*.

H(2) = 218405
H(10) = 310594 } calc

$$\frac{310594 - 218405}{10 - 2} = \$11523.63$$

Explain what this rate of change means as it relates to median house prices.

On average, the houses value increases $11523.63 every year

Score 2: The student made a rounding error and wrote an incomplete explanation.

Question 34

34 In the town of Skaneateles, New York, house prices since 2008 have changed based on the function $H(t) = 200{,}000(1.045)^t$, where t is the number of years since 2008 and $H(t)$ is the median house price. Determine the average rate of change for the median house price in Skaneateles from 2010 to 2018 to the *nearest dollar per year*.

$H(2) = 200{,}000(1.045)^2$

$= 218{,}405$

$H(8) = 200{,}000(1.045)^8$

$= 284{,}420.12$

$\text{arc} = \frac{f(b) - f(a)}{b - a}$

$\frac{284{,}420.12 - 218{,}405}{8 - 2} = \frac{66{,}015.12}{6} = \$11{,}002.52$

Explain what this rate of change means as it relates to median house prices.

Every year, the price basically goes up about $11,002.52.

Score 1: The student received one credit for an incomplete explanation.

Question 34

34 In the town of Skaneateles, New York, house prices since 2008 have changed based on the function $H(t) = 200{,}000(1.045)^t$, where t is the number of years since 2008 and $H(t)$ is the median house price. Determine the average rate of change for the median house price in Skaneateles from 2010 to 2018 to the *nearest dollar per year*.

$200{,}000(1.045)^8 = 284{,}420.1226$

$284,420

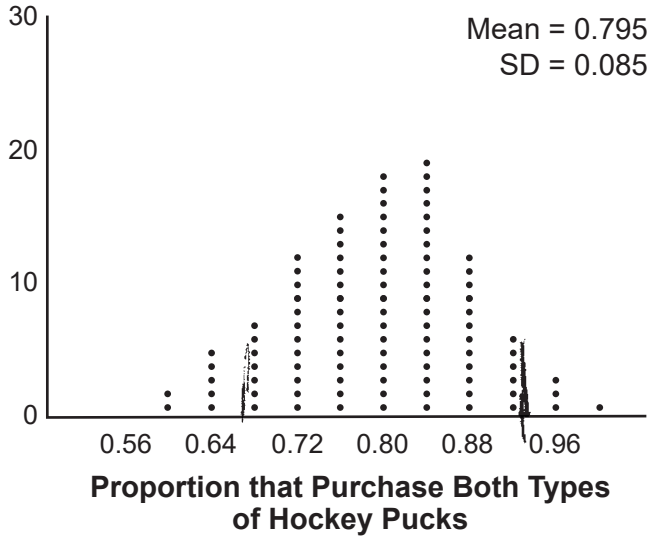
Explain what this rate of change means as it relates to median house prices.

This rate of change means that the price of a house in the town of Skaneateles, New York has increased.

Score 0: The student did not show enough relevant course-level work to receive any credit.

Question 35

35 A sporting goods manufacturer is trying to determine if they should continue to produce multiple types of hockey pucks. The company surveyed 50 randomly chosen customers and asked them if they purchased both game regulation pucks and lighter training pucks. Of those surveyed, 40 of them said that they purchase both types of pucks. A simulation that was run 100 times based on the survey results produced the approximately normal results below.



a) Determine an interval containing the middle 95% of plausible values that estimates the proportion of all customers who would purchase both types of pucks from the company.

.795 + 2(0.085) = .965

.795 − 2(0.085) = .625

.965 − .625

.625 - .965

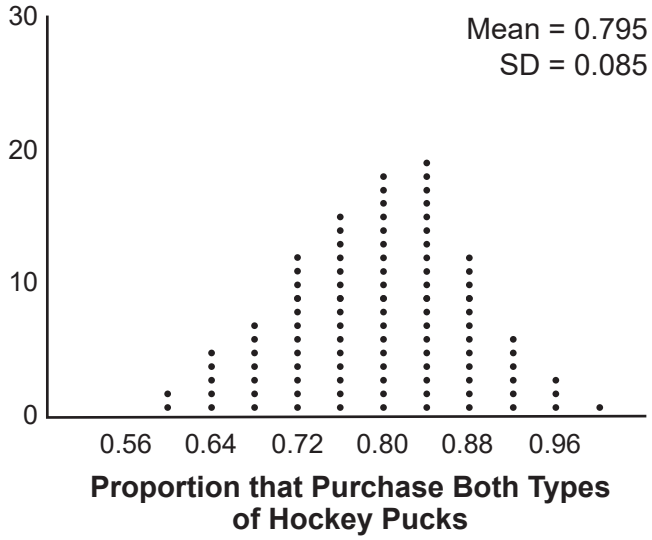
b) The company will continue to manufacture both types of hockey pucks if it is reasonable to assume that the true proportion of customers who buy both types of hockey pucks is above 0.60. Using the interval from part *a*, explain whether or not the company should continue to produce both types of hockey pucks.

Yes. .625, the bottom number of the 95%, is above .60

Score 4: The student gave a complete and correct response.

Question 35

35 A sporting goods manufacturer is trying to determine if they should continue to produce multiple types of hockey pucks. The company surveyed 50 randomly chosen customers and asked them if they purchased both game regulation pucks and lighter training pucks. Of those surveyed, 40 of them said that they purchase both types of pucks. A simulation that was run 100 times based on the survey results produced the approximately normal results below.



a) Determine an interval containing the middle 95% of plausible values that estimates the proportion of all customers who would purchase both types of pucks from the company.

(0.[illegible]5, 0.965)

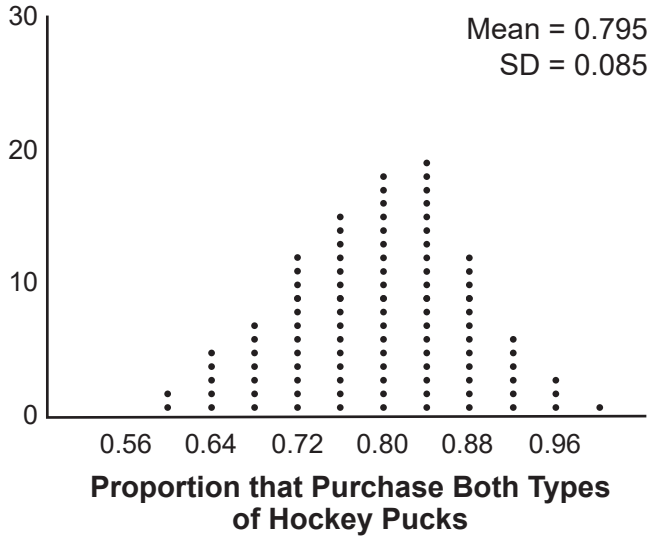
b) The company will continue to manufacture both types of hockey pucks if it is reasonable to assume that the true proportion of customers who buy both types of hockey pucks is above 0.60. Using the interval from part *a*, explain whether or not the company should continue to produce both types of hockey pucks.

they should continue to produce them because the 95% confidence range is above 0.6

Score 3: The student did not show any work to find the correct interval.

Question 35

35 A sporting goods manufacturer is trying to determine if they should continue to produce multiple types of hockey pucks. The company surveyed 50 randomly chosen customers and asked them if they purchased both game regulation pucks and lighter training pucks. Of those surveyed, 40 of them said that they purchase both types of pucks. A simulation that was run 100 times based on the survey results produced the approximately normal results below.



a) Determine an interval containing the middle 95% of plausible values that estimates the proportion of all customers who would purchase both types of ~~pu~~cks from the company.

2 SD's

2 · .085 = .17
.795 − .17 = .625
.795 + .17 = .965

between .625 and .965

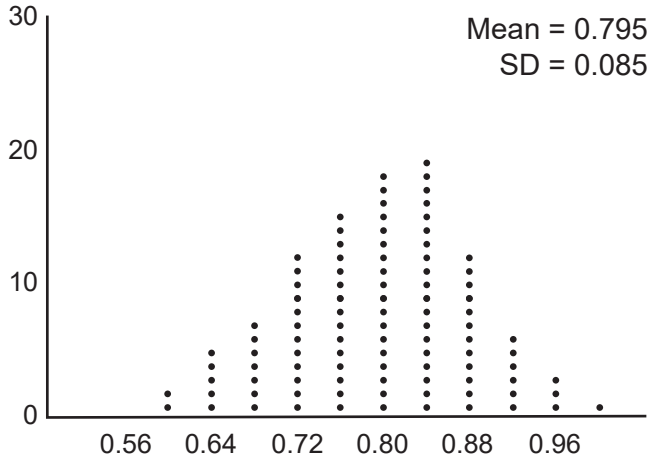
b) The company will continue to manufacture both types of hockey pucks if it is reasonable to assume that the true proportion of customers who buy both types of hockey pucks is above 0.60. Using the interval from part *a*, explain whether or not the company should continue to produce both types of hockey pucks.

The true proportion of costomers who by both types of hockey Pucks is above .60, so the Company should Continue to Produce both types of hockey Pucks.

Score 3: The student explanation did not reference the interval.

Question 35

35 A sporting goods manufacturer is trying to determine if they should continue to produce multiple types of hockey pucks. The company surveyed 50 randomly chosen customers and asked them if they purchased both game regulation pucks and lighter training pucks. Of those surveyed, 40 of them said that they purchase both types of pucks. A simulation that was run 100 times based on the survey results produced the approximately normal results below.



a) Determine an interval containing the middle 95% of plausible values that estimates the proportion of all customers who would purchase both types of pucks from the company.

.795 ± 2(.085)

.965

.625

.625 to .965

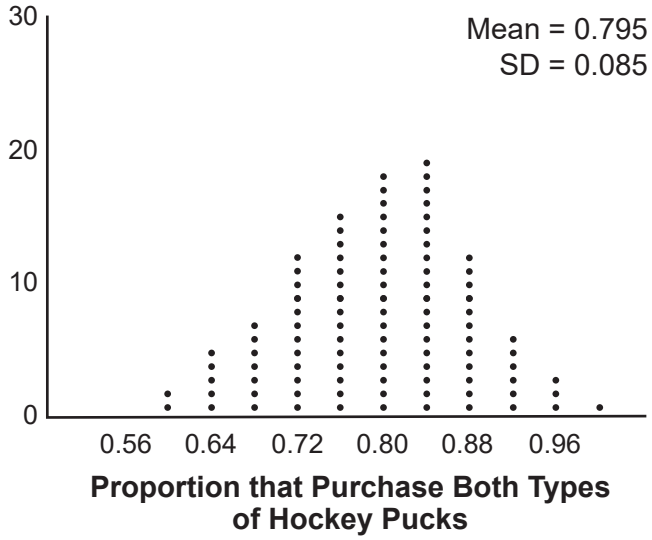
b) The company will continue to manufacture both types of hockey pucks if it is reasonable to assume that the true proportion of customers who buy both types of hockey pucks is above 0.60. Using the interval from part *a*, explain whether or not the company should continue to produce both types of hockey pucks.

Yes they should produce more both types of hockey pucks because in the graph, only 3 proportions are out side the 95%, making them irrelavent.

Score 2: The student gave an incorrect explanation.

Question 35

35 A sporting goods manufacturer is trying to determine if they should continue to produce multiple types of hockey pucks. The company surveyed 50 randomly chosen customers and asked them if they purchased both game regulation pucks and lighter training pucks. Of those surveyed, 40 of them said that they purchase both types of pucks. A simulation that was run 100 times based on the survey results produced the approximately normal results below.



a) Determine an interval containing the middle 95% of plausible values that estimates the proportion of all customers who would purchase both types of pucks from the company.

$.795 + 2(.085) = .965$
$.795 - 2(.085) = .625$
$\{.625 - .965\}$

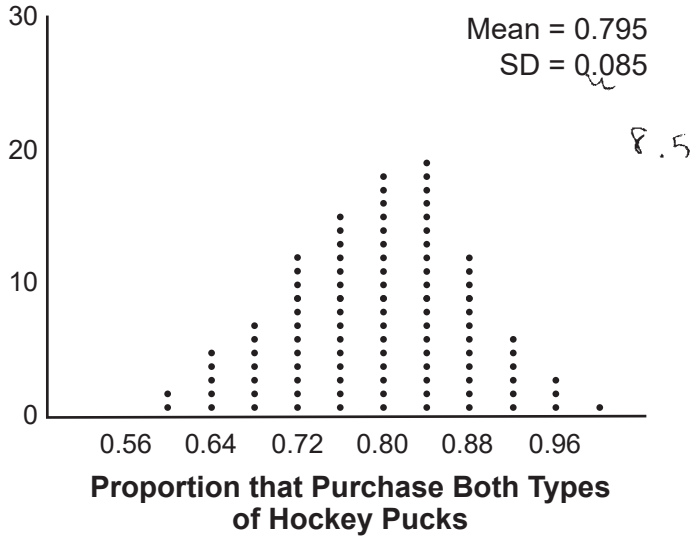
b) The company will continue to manufacture both types of hockey pucks if it is reasonable to assume that the true proportion of customers who buy both types of hockey pucks is above 0.60. Using the interval from part *a*, explain whether or not the company should continue to produce both types of hockey pucks.

They should not since .60 is outside the middle 95%

Score 2: The student gave an incorrect explanation.

Question 35

35 A sporting goods manufacturer is trying to determine if they should continue to produce multiple types of hockey pucks. The company surveyed 50 randomly chosen customers and asked them if they purchased both game regulation pucks and lighter training pucks. Of those surveyed, 40 of them said that they purchase both types of pucks. A simulation that was run 100 times based on the survey results produced the approximately normal results below.



a) Determine an interval containing the middle 95% of plausible values that estimates the proportion of all customers who would purchase both types of pucks from the company.

0.84 ± 0.085

$[0.755, 0.925]$

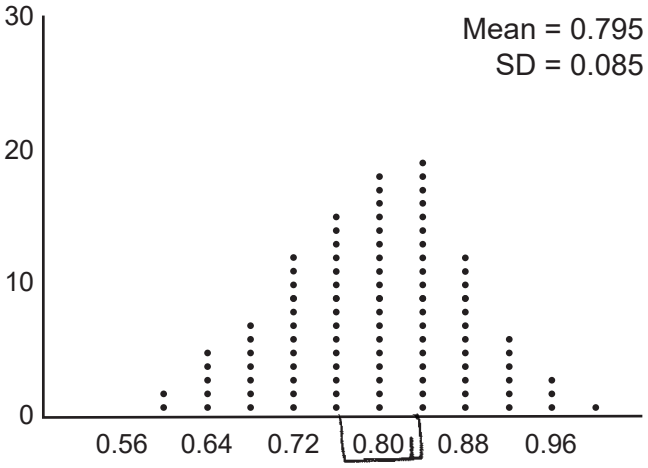
b) The company will continue to manufacture both types of hockey pucks if it is reasonable to assume that the true proportion of customers who buy both types of hockey pucks is above 0.60. Using the interval from part *a*, explain whether or not the company should continue to produce both types of hockey pucks.

The company should keep producing both types of hockey pucks because the proportion of customers who buy both types is above 0.60.

Score 1: The student determined an incorrect interval and gave an incomplete explanation.

Question 35

35 A sporting goods manufacturer is trying to determine if they should continue to produce multiple types of hockey pucks. The company surveyed 50 randomly chosen customers and asked them if they purchased both game regulation pucks and lighter training pucks. Of those surveyed, 40 of them said that they purchase both types of pucks. A simulation that was run 100 times based on the survey results produced the approximately normal results below.



80 82 (84) 86 88 72 74 (76) 78 80

a) Determine an interval containing the middle 95% of plausible values that estimates the proportion of all customers who would purchase both types of pucks from the company.

The interval that contains the middle 95% is from 0.76 to 0.84.

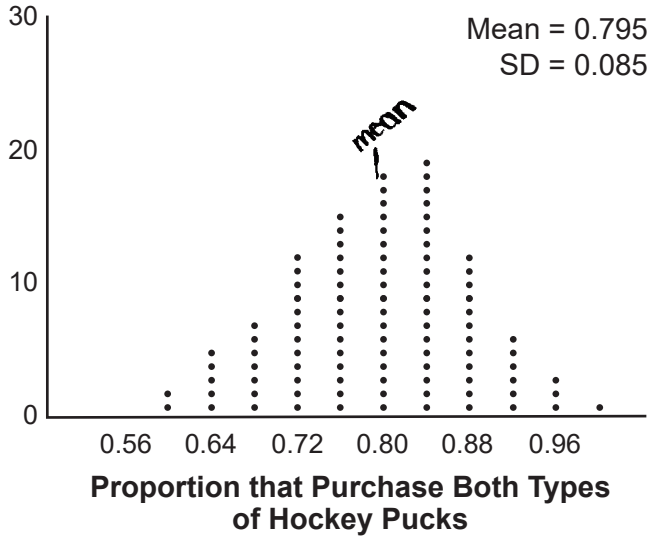
b) The company will continue to manufacture both types of hockey pucks if it is reasonable to assume that the true proportion of customers who buy both types of hockey pucks is above 0.60. Using the interval from part *a*, explain whether or not the company should continue to produce both types of hockey pucks.

The company should continue to manufacture both types of hockey pucks because in the interval it ranges from 0.76 to 0.84. In the interval the people by about 20 or more pucks. Which shows both types of hockey pucks are in high demand.

Score 0: The student's response did not contain enough course-level work to receive any credit.

Question 35

35 A sporting goods manufacturer is trying to determine if they should continue to produce multiple types of hockey pucks. The company surveyed 50 randomly chosen customers and asked them if they purchased both game regulation pucks and lighter training pucks. Of those surveyed, 40 of them said that they purchase both types of pucks. A simulation that was run 100 times based on the survey results produced the approximately normal results below.



a) Determine an interval containing the middle 95% of plausible values that estimates the proportion of all customers who would purchase both types of pucks from the company.

.76 - .82

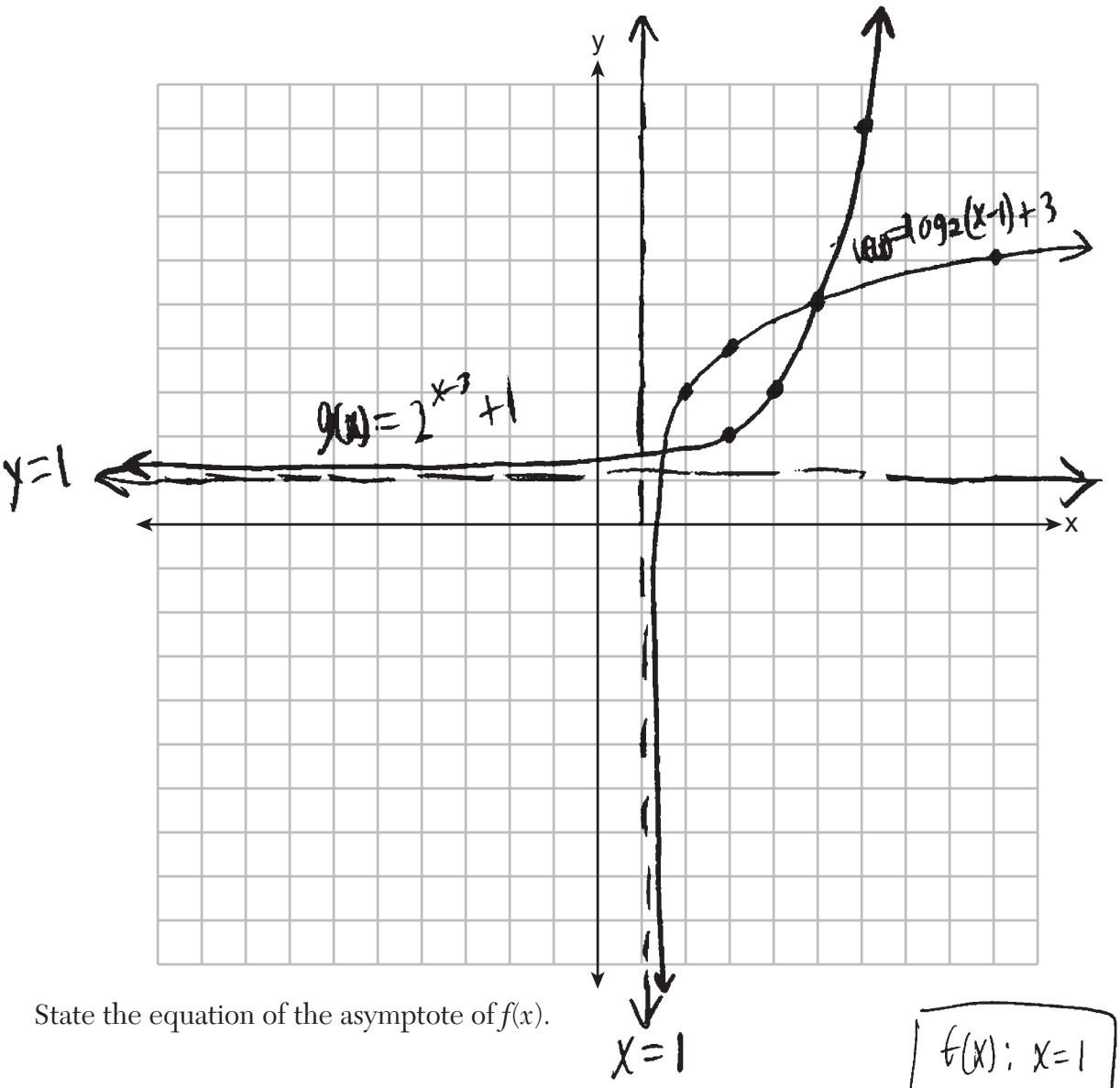
b) The company will continue to manufacture both types of hockey pucks if it is reasonable to assume that the true proportion of customers who buy both types of hockey pucks is above 0.60. Using the interval from part *a*, explain whether or not the company should continue to produce both types of hockey pucks.

yes, the company should continue to produce both types of pucks because .80% of people are buying them & thats a large percentage.

Score 0: The student's response did not contain enough course-level work to receive any credit.

Question 36

36 Graph $y = f(x)$, where $f(x) = \log_2(x - 1) + 3$ on the set of axes below.



f(x)

x	y
2	3
3	4
5	5
9	6

g(x)

x	y
3	2
4	3
5	5
6	9

State the equation of the asymptote of $f(x)$.

f(x): x=1
g(x): y=1

When $f(x)$ is reflected over the line $y = x$, a new function is formed: $g(x) = 2^{x-3} + 1$. State the equation of the asymptote of $g(x)$.

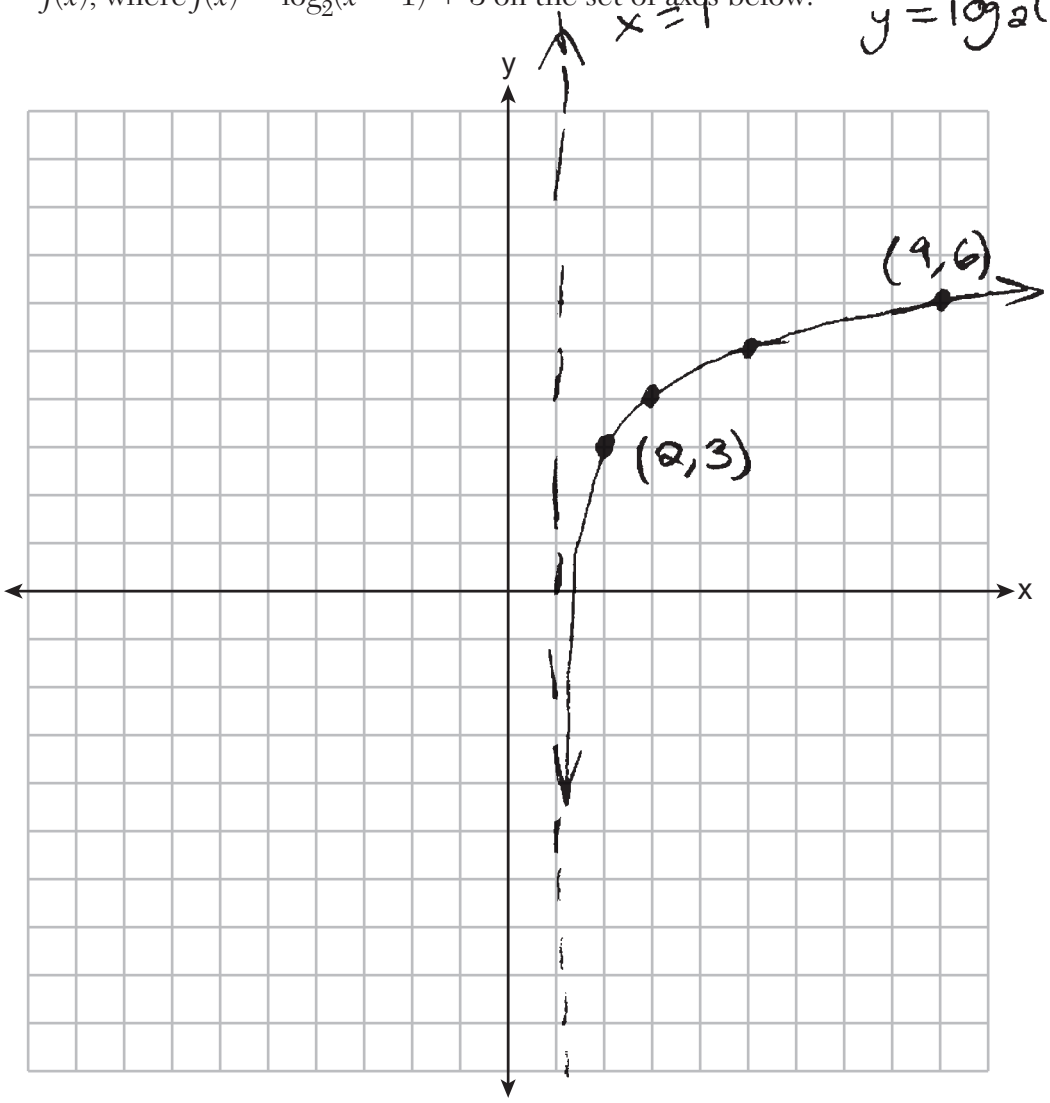
Score 4: The student gave a complete and correct response.

Question 36

36 Graph $y = f(x)$, where $f(x) = \log_2(x - 1) + 3$ on the set of axes below.

right 1 up 3

$y = \log_2(x-1)+3$



State the equation of the asymptote of $f(x)$.

$f(x)$ asymptote $= x = 1$

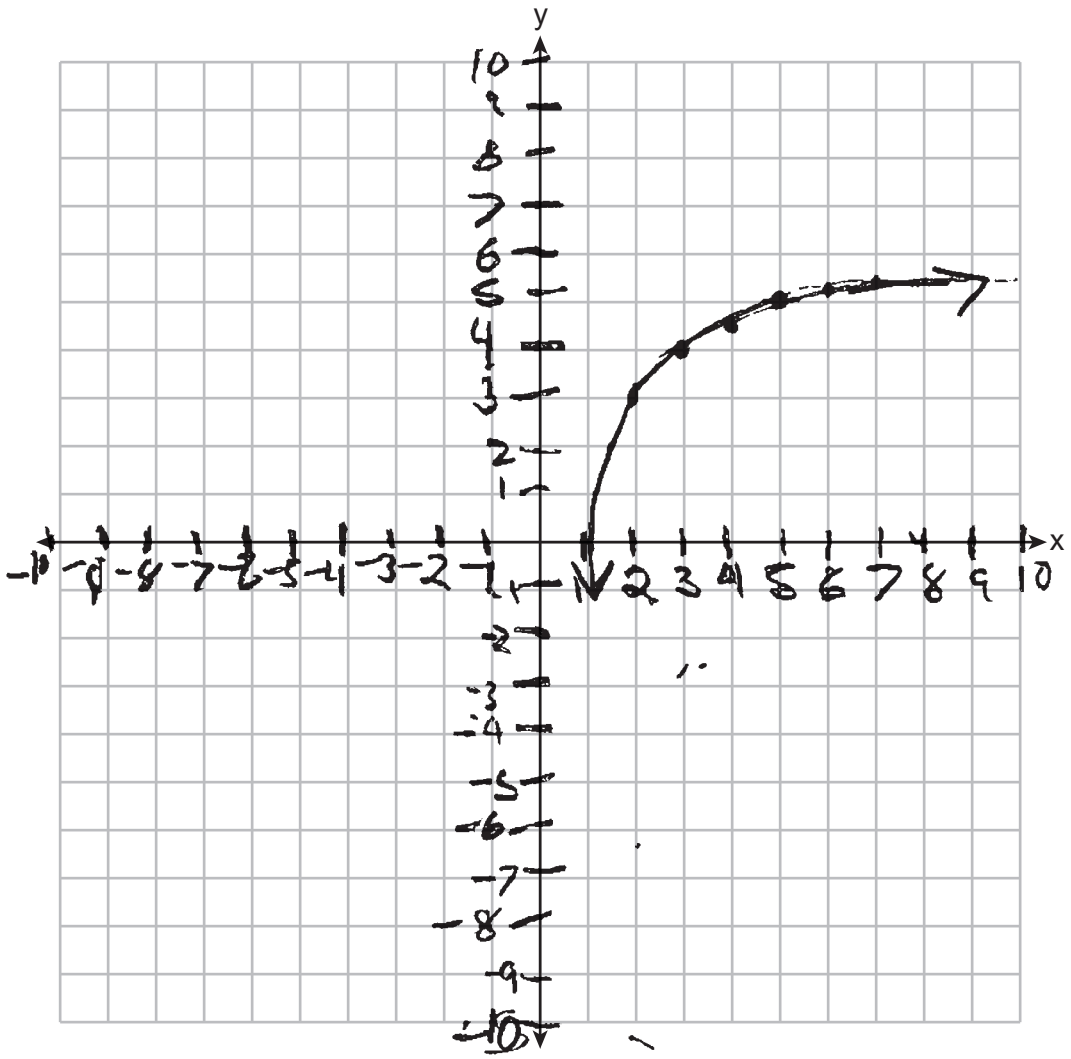
When $f(x)$ is reflected over the line $y = x$, a new function is formed: $g(x) = 2^{x-3} + 1$. State the equation of the asymptote of $g(x)$.

$g(x)$ asymptote $= y = 1$

Score 4: The student gave a complete and correct response.

Question 36

36 Graph $y = f(x)$, where $f(x) = \log_2(x - 1) + 3$ on the set of axes below.



State the equation of the asymptote of $f(x)$.

F(x) = x = 1

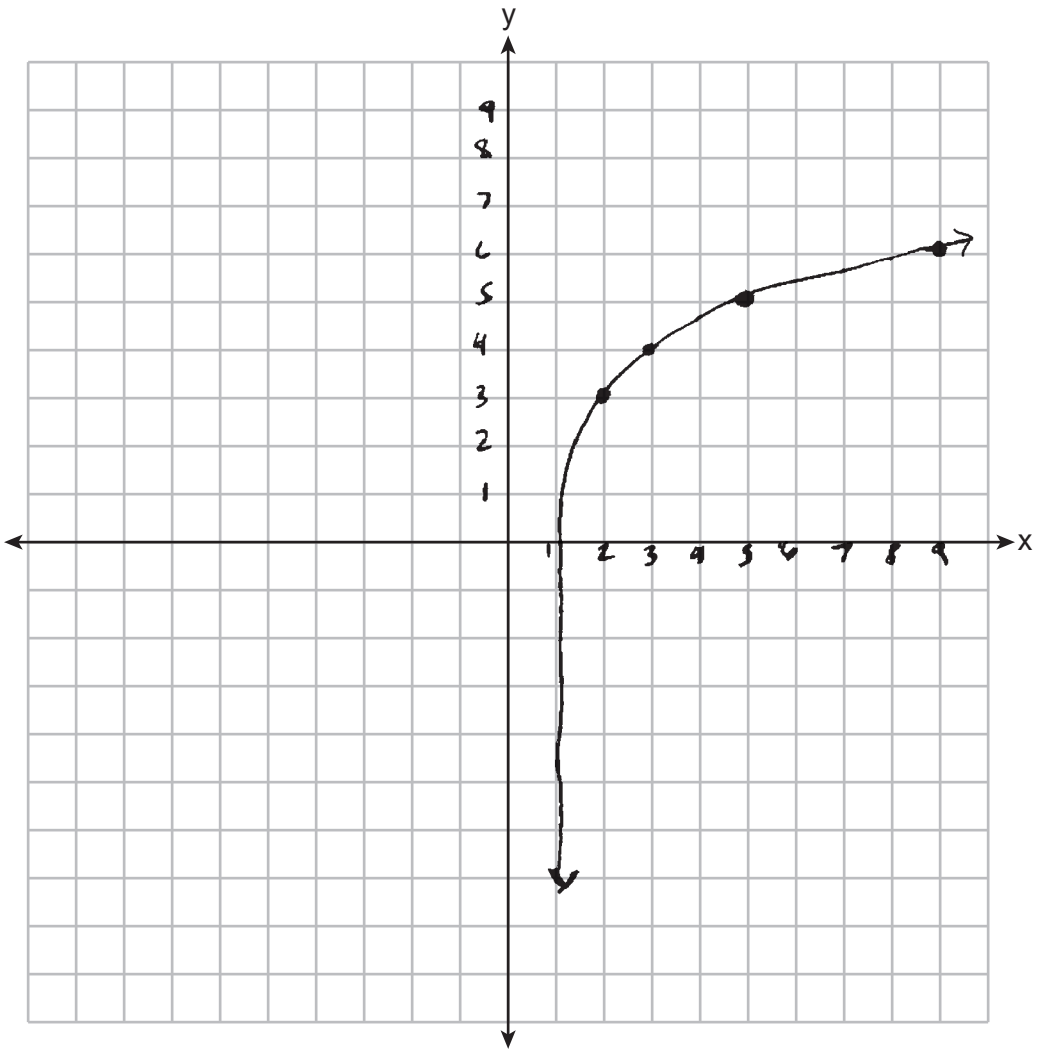
When $f(x)$ is reflected over the line $y = x$, a new function is formed: $g(x) = 2^{x-3} + 1$. State the equation of the asymptote of $g(x)$.

g(x) = y = 1

Score 3: The student made a graphing error at $x = 9$.

Question 36

36 Graph $y = f(x)$, where $f(x) = \log_2(x - 1) + 3$ on the set of axes below.



State the equation of the asymptote of $f(x)$.

asymptote of $f(x) = x > 1$

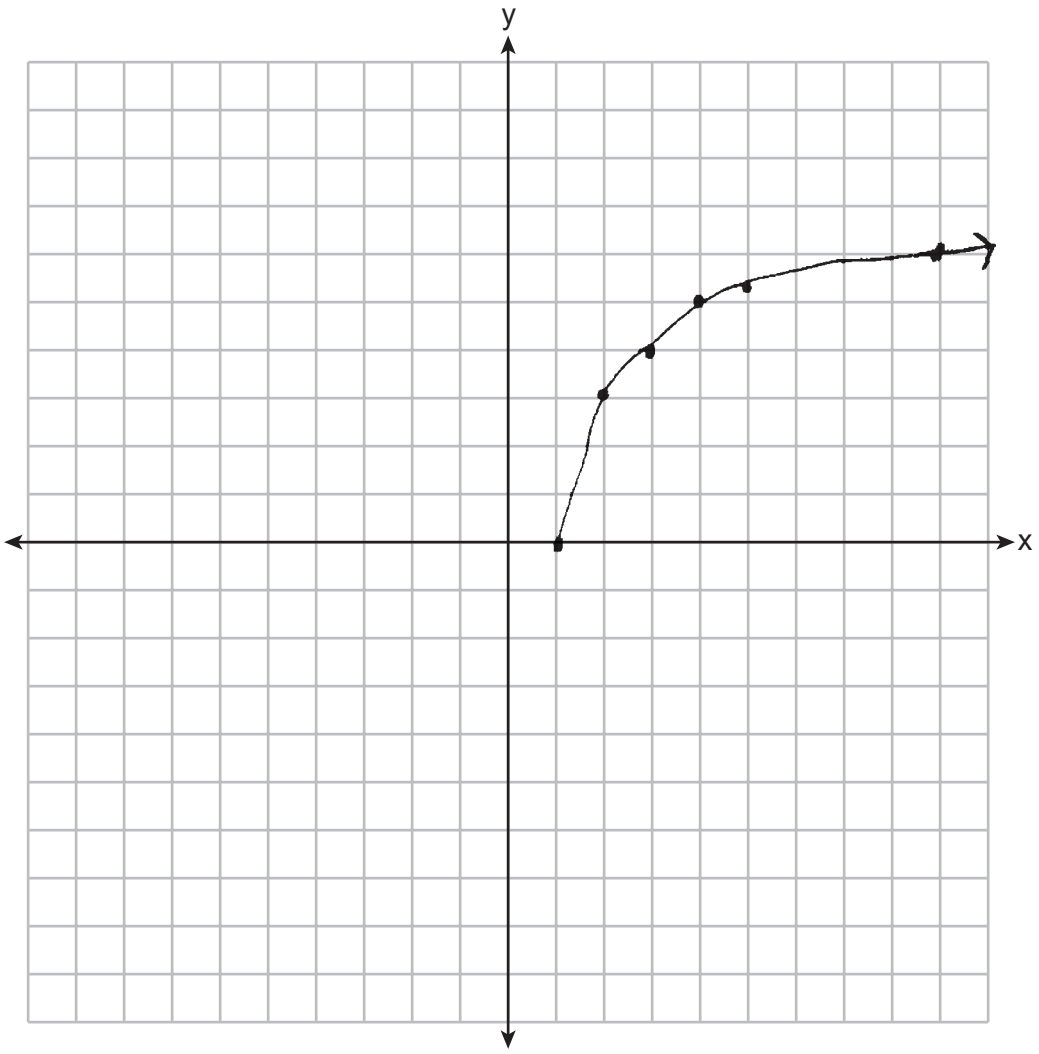
When $f(x)$ is reflected over the line $y = x$, a new function is formed: $g(x) = 2^{x-3} + 1$.
State the equation of the asymptote of $g(x)$.

asymptote of $g(x) = y > 1$

Score 2: The student stated incorrect asymptotes.

Question 36

36 Graph $y = f(x)$, where $f(x) = \log_2(x - 1) + 3$ on the set of axes below.



State the equation of the asymptote of $f(x)$.

f(x): x=1

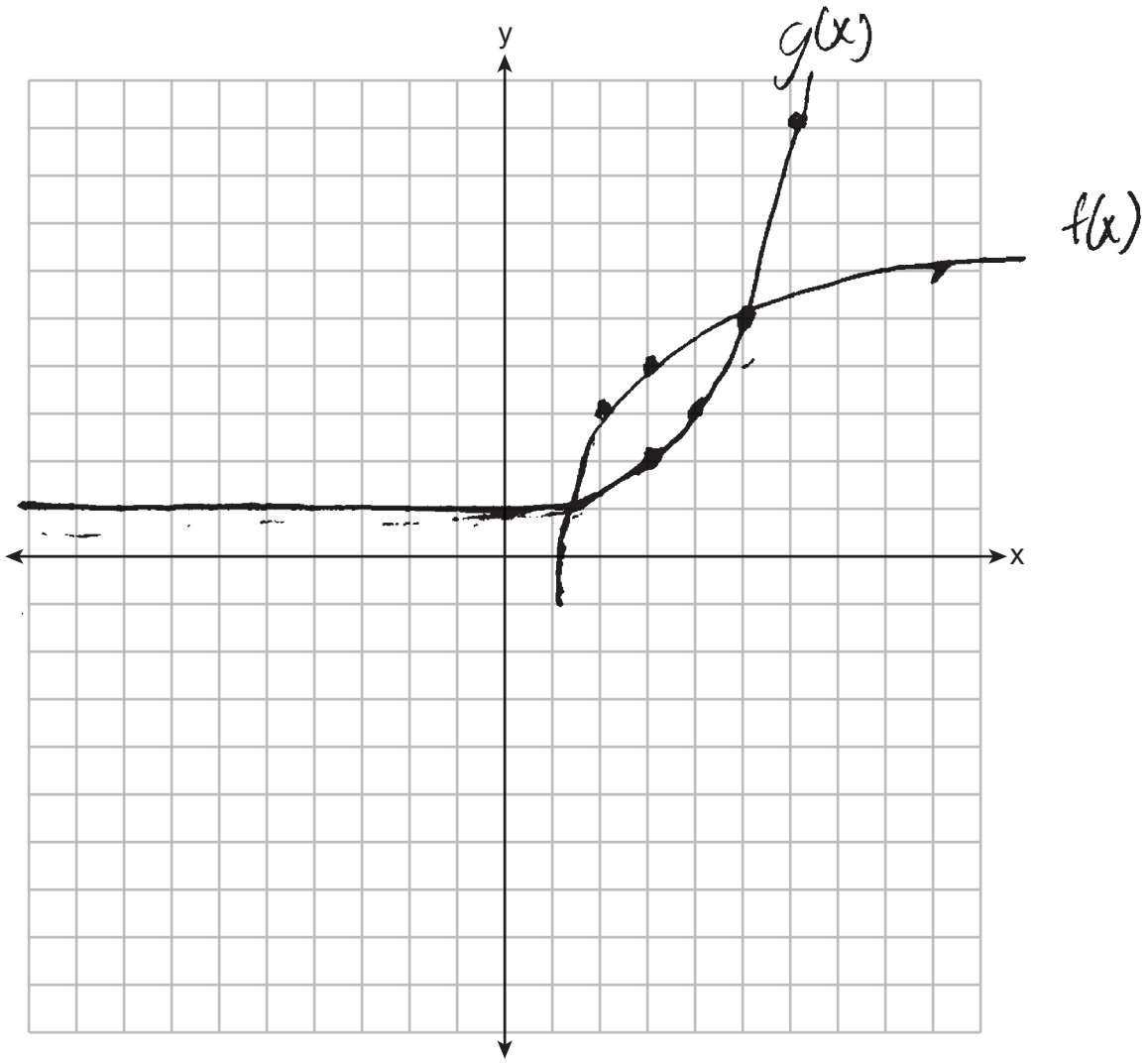
When $f(x)$ is reflected over the line $y = x$, a new function is formed: $g(x) = 2^{x-3} + 1$. State the equation of the asymptote of $g(x)$.

g(x): y=1

Score 2: The student made two graphing errors.

Question 36

36 Graph $y = f(x)$, where $f(x) = \log_2(x - 1) + 3$ on the set of axes below.



State the equation of the asymptote of $f(x)$.

f(x) asymptote = (1, 0)

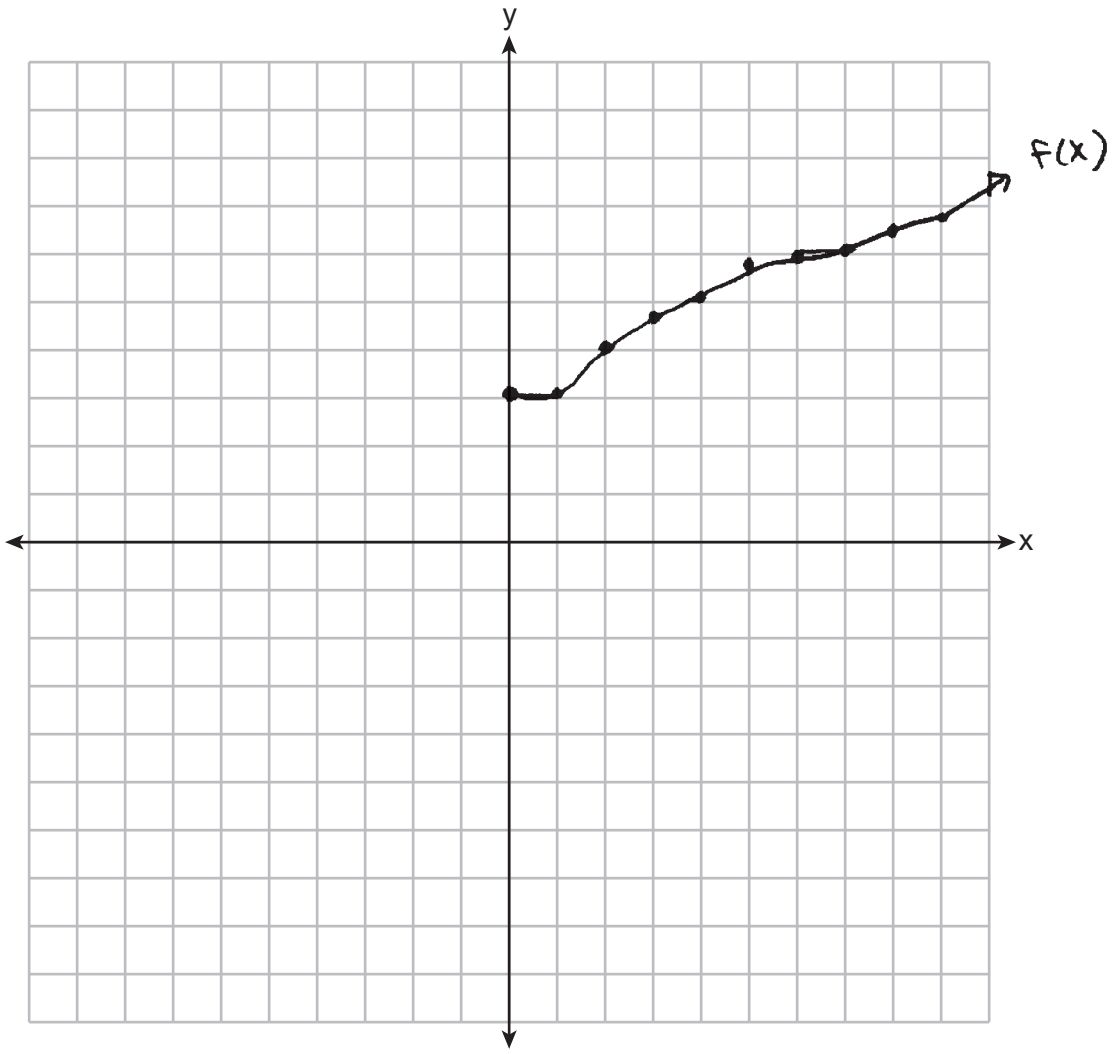
When $f(x)$ is reflected over the line $y = x$, a new function is formed: $g(x) = 2^{x-3} + 1$.
State the equation of the asymptote of $g(x)$.

g(x) asymptote = (0, 1)

Score 1: The student made one graphing error and stated incorrect asymptotes.

Question 36

36 Graph $y = f(x)$, where $f(x) = \log_2(x - 1) + 3$ on the set of axes below.



State the equation of the asymptote of $f(x)$.

f(x) → asymtote → x = -3

When $f(x)$ is reflected over the line $y = x$, a new function is formed: $g(x) = 2^{x-3} + 1$. State the equation of the asymptote of $g(x)$.

g(x) → asymtote → x = -1

Score 0: The student did not show enough course-level work to receive any credit.

Question 37

37 Megan is performing an experiment in a lab where the air temperature is a constant 73°F and the liquid is 237°F. One and a half hours later, the temperature of the liquid is 112°F. Newton's law of cooling states $T(t) = T_a + (T_0 - T_a)e^{-kt}$ where:

$T(t)$: temperature, °F, of the liquid at t hours
T_a: air temperature
T_0: initial temperature of the liquid
k: constant

Determine the value of k, to the *nearest thousandth*, for this liquid.

$112 = 73 + (237 - 73)e^{-k(1.5)}$

$-73 \quad -73$

$\frac{39}{164} = \frac{164e^{-k(1.5)}}{164}$

$\ln\frac{39}{164} = -1.5k$

$-1.48 = -1.5k$

$k = .958$

Question 37 is continued on the next page.

Score 6: The student gave a complete and correct response.

Question 37

Determine the temperature of the liquid using your value for k, to the *nearest degree*, after two and a half hours.

$T(t) = 73 + (237 - 73)e^{-.958(2.5)}$

$T(t) = 88°$

Megan needs the temperature of the liquid to be 80°F to perform the next step in her experiment. Use your value for k to determine, to the *nearest tenth of an hour*, how much time she must wait since she first began the experiment.

$80 = 73 + (237 - 73)e^{-.958(x)}$

$-73 \quad -73$

$\frac{7}{164} = \frac{164}{164} e^{-.958(x)}$

It would be 3.3 hours

$\ln \frac{7}{164} = -.958(x) \ln e^1$

$-.958x = -3.15$

Question 37

37 Megan is performing an experiment in a lab where the air temperature is a constant 73°F and the liquid is 237°F. One and a half hours later, the temperature of the liquid is 112°F. Newton's law of cooling states $T(t) = T_a + (T_0 - T_a)e^{-kt}$ where:

$T(t)$: temperature, °F, of the liquid at t hours
T_a: air temperature
T_0: initial temperature of the liquid
k: constant

Determine the value of k, to the *nearest thousandth*, for this liquid.

$39 =)e^{-73(1.5)}$

$k = .958$

$\frac{39}{164} = e^{-k(1.5)}$

$112 = 73 + (237-73)e^{-k(1.5)}$

$\frac{\log 39 - \log 164}{1.5} = \frac{-k(1.5)}{1.5}\log e$

$-.415853 = -k \log e$

$-k = -.957$

Question 37 is continued on the next page.

Score 6: The student gave a complete and correct response.

Question 37

Determine the temperature of the liquid using your value for k, to the *nearest degree*, after two and a half hours.

$T(t) = 73 + (237 - 73)e^{-.958(2.5)}$

$T(t) = 88°F$

Megan needs the temperature of the liquid to be 80°F to perform the next step in her experiment. Use your value for k to determine, to the *nearest tenth of an hour*, how much time she must wait since she first began the experiment.

$x = 3.3$ hours

$\frac{1.4298}{\log e} = \frac{x \log e}{\log e}$

$\frac{7}{164} = e^{-.958(x)}$

$80 = 73 + (237 - 73)e^{-.958(x)}$

$\frac{\log 7 - \log 164}{-.958} = \frac{-.958(x)\log e}{-.958}$

$\frac{7}{(237-73)} = \frac{(237-73)e^{-.958(x)}}{(237-73)}$

Question 37

37 Megan is performing an experiment in a lab where the air temperature is a constant 73°F and the liquid is 237°F. One and a half hours later, the temperature of the liquid is 112°F. Newton's law of cooling states $T(t) = T_a + (T_0 - T_a)e^{-kt}$ where:

$T(t)$: temperature, °F, of the liquid at t hours
T_a: air temperature
T_0: initial temperature of the liquid
k: constant

Determine the value of k, to the *nearest thousandth*, for this liquid.

$112 = 73 + (237 - 73)e^{-k90}$

$112 = 73 + (164)e^{-k90}$

$-73 \quad -73$

$\frac{39}{164} = \frac{164e^{-k90}}{164}$

$.2378 = e^{-k90}$

$\ln(.2378) = \ln(e)^{-k90}$

$\frac{\ln(.2378)}{-90} = \frac{-k90}{-90}$

$.016 = k$

Question 37 is continued on the next page.

Score 5: The student used incorrect time units when solving for k.

Determine the temperature of the liquid using your value for k, to the *nearest degree*, after two and a half hours.

$T(t) = 73 + (237 - 73)e^{(-.016)(150)}$ ↳ 150 min

$T(t) = 73 + (164)e^{(-.016)(150)}$

$73 + (164)(.0907)$

$73 + (14.877)$

$T(t) = 88°F$

Megan needs the temperature of the liquid to be 80°F to perform the next step in her experiment. Use your value for k to determine, to the *nearest tenth of an hour*, how much time she must wait since she first began the experiment.

$80 = 73 + (237 - 73)e^{(-.016)t}$

$-73 \quad -73$

$\frac{7}{164} = \frac{164e^{-.016t}}{164}$

$.043 = e^{-.016t}$

$\ln(.043) = \ln(e)^{-.016t}$

$\frac{\ln(.043)}{-.016} = \frac{-.016t}{-.016}$

$197.12 = t$ min

↳ $t = 3.3$ hrs

Question 37

37 Megan is performing an experiment in a lab where the air temperature is a constant 73°F and the liquid is 237°F. One and a half hours later, the temperature of the liquid is 112°F. Newton's law of cooling states $T(t) = T_a + (T_0 - T_a)e^{-kt}$ where:

$T(t)$: temperature, °F, of the liquid at t hours
T_a: air temperature
T_0: initial temperature of the liquid
k: constant

Determine the value of k, to the *nearest thousandth*, for this liquid.

$112 = 73 + (237 - 73)e^{-k(1.5)}$

$39 = 164e^{-k(1.5)}$

$\ln\left(\frac{39}{164}\right) = -k(1.5)$

.958

Question 37 is continued on the next page.

Score 5: The student made one computational error solving for t.

Question 37

Determine the temperature of the liquid using your value for k, to the *nearest degree*, after two and a half hours.

$T(t) = 73 + (237 - 73)e^{-.958(2.5)}$

$T(t) = 88°F$

88°F

Megan needs the temperature of the liquid to be 80°F to perform the next step in her experiment. Use your value for k to determine, to the *nearest tenth of an hour*, how much time she must wait since she first began the experiment.

$80 = 73 + (237 - 73)e^{-.958t}$

$7 = 164e^{-.958t}$

$\ln \frac{7}{164} = t$

$\frac{-.958}{3.02} = t$

3.0 hours

Question 37

37 Megan is performing an experiment in a lab where the air temperature is a constant 73°F and the liquid is 237°F. One and a half hours later, the temperature of the liquid is 112°F. Newton's law of cooling states $T(t) = T_a + (T_0 - T_a)e^{-kt}$ where:

$T(t)$: temperature, °F, of the liquid at t hours
T_a: air temperature
T_0: initial temperature of the liquid
k: constant

Determine the value of k, to the *nearest thousandth*, for this liquid.

$112. = 73 + (237 - 73)e^{-k(1.5)}$
$-73 \quad -73$
$\frac{39}{164} = \frac{(164)e^{-k(1.5)}}{164}$
$\frac{39}{164} = e^{-k(1.5)}$
$\ln\frac{39}{164} = -1.5$
$\frac{-1.436}{-1.5} = \frac{-1.5k}{-1.5}$
$k = 1.045$

Question 37 is continued on the next page.

Score 4: The student made an error solving for k and a rounding error determining the temperature.

Question 37

Determine the temperature of the liquid using your value for k, to the *nearest degree*, after two and a half hours.

$T(t) = 85.03$

$T(t) = 73 + (237 - 73)e^{(-1.045)(2.5)}$

$T(t) = 73 + (164)e^{-2.6125}$

$T(t) = 73 + 12.03$

Megan needs the temperature of the liquid to be 80°F to perform the next step in her experiment. Use your value for k to determine, to the *nearest tenth of an hour*, how much time she must wait since she first began the experiment.

$t = 3.0$

$80 = 73 + (237 - 73)e^{-1.045(t)}$

$-73 \quad -73$

$\frac{7}{164} = \frac{(164)e^{-1.045t}}{164}$

$\frac{-3.15}{-1.045} = \frac{-1.045t}{-1.045}$

$\ln\left(\frac{7}{164}\right) = -1.045t$

$\frac{7}{164} = e^{-1.045t}$

Question 37

37 Megan is performing an experiment in a lab where the air temperature is a constant 73°F and the liquid is 237°F. One and a half hours later, the temperature of the liquid is 112°F. Newton's law of cooling states $T(t) = T_a + (T_0 - T_a)e^{-kt}$ where:

$T(t)$: temperature, °F, of the liquid at t hours
T_a: air temperature
T_0: initial temperature of the liquid
k: constant

Determine the value of k, to the ~~*nearest thousandth*~~, for this liquid.

$K = .96$

$\ln\frac{39}{164} = -k(1.5)$

$\frac{\ln\frac{39}{164}}{1.5} = \frac{-k(1.5)}{1.5}$

$-.95753652 = -k$

$\frac{-.95753652}{-1} = \frac{-k}{-1}$

$k = .957$

$T(t) = 73^0 + (237-73)e^{-kt}$

$1.12 = 73 + (237-73)e^{-k(1.5)}$

$-73 \quad -73$

$39 = (237-73)e^{-k(1.5)}$

$\frac{39}{164} = \frac{(237-73)e^{-k(1.5)}}{164}$

$\frac{39}{164} = e^{-k(1.5)}$

Question 37 is continued on the next page.

Score 3: The student made a rounding error solving for k and received no credit for the third part.

Question 37

Determine the temperature of the liquid using your value for k, to the *nearest degree*, after two and a half hours.

$T(t) = 73 + (237 - 73)e^{-.96(2.5)}$

$T(2.5) = 87.87$

$T(2.5) = 88°F$

Megan needs the temperature of the liquid to be 80°F to perform the next step in her experiment. Use your value for k to determine, to the *nearest tenth of an hour*, how much time she must wait since she first began the experiment.

$80°F = 73 + (237 - 73)e^{-.96(x)}$

$-73 \quad -73$

$7 = (237 - 73)e^{-.96(x)}$

Question 37

37 Megan is performing an experiment in a lab where the air temperature is a constant 73°F and the liquid is 237°F. One and a half hours later, the temperature of the liquid is 112°F. Newton's law of cooling states $T(t) = T_a + (T_0 - T_a)e^{-kt}$ where:

$T(t)$: temperature, °F, of the liquid at t hours
T_a: air temperature
T_0: initial temperature of the liquid
k: constant

Determine the value of k, to the *nearest thousandth*, for this liquid.

$k = .9575$

$T(t) = T_a + (T_0 - T_a)e^{-kt}$

$237 = 73 + (112 - 73)e^{-k(1.5)}$

-73

$\frac{164}{139} = \frac{39e^{-k1.5}}{39}$

$\frac{\ln \frac{164}{39}}{-1.5} = \frac{\ln e^{-1.5k}}{-1.5}$

Question 37 is continued on the next page.

Score 2: The student determined an appropriate time.

Question 37

Determine the temperature of the liquid using your value for k, to the *nearest degree*, after two and a half hours.

$237 = 73 + (112 - 73)e^{-k(2.5)}$

$\frac{164}{39} = \frac{39e^{-k(2.5)}}{39}$

$\ln\frac{164}{39} = \ln e \cdot -2.5k$

$\frac{\ln\frac{164}{39}}{-2.5} = \frac{-2.5k}{-2.5}$

$-.5$

$-.1°$

Megan needs the temperature of the liquid to be 80°F to perform the next step in her experiment. Use your value for k to determine, to the *nearest tenth of an hour*, how much time she must wait since she first began the experiment.

$80° = 73 + (112 - 73)e^{-.9575t}$

$-73 \quad -73$

$\frac{7}{39} = \frac{39e^{-.9575t}}{39}$

$\ln\frac{7}{39} = \ln e \cdot -.9575t$

$\frac{7}{39} = e^{-.9575t}$

$t = 1.79$

$t = 1.8$ hrs

Question 37

37 Megan is performing an experiment in a lab where the air temperature is a constant 73°F and the liquid is 237°F. One and a half hours later, the temperature of the liquid is 112°F. Newton's law of cooling states $T(t) = T_a + (T_0 - T_a)e^{-kt}$ where:

$T(t)$: temperature, °F, of the liquid at t hours
T_a: air temperature
T_0: initial temperature of the liquid
k: constant

Determine the value of k, to the *nearest thousandth*, for this liquid.

$112 = 73 + (267 - 73)e^{-k(1\frac{1}{2})}$

$39 = 164e^{-k(1\frac{1}{2})}$

$\ln\left(\frac{39}{164}\right) = -k(1\frac{1}{2})$

$\frac{-2\ln\frac{39}{164}}{3} = k$ $\quad k \approx 2.496$

Question 37 is continued on the next page.

Score 1: The student made one computational error in finding k.

Question 37

Determine the temperature of the liquid using your value for k, to the *nearest degree*, after two and a half hours.

1 degree = $\frac{\pi}{180}$ radians

$2\frac{1}{2} = 112°F\ (237°F - 112°F)e^{-}$

Megan needs the temperature of the liquid to be 80°F to perform the next step in her experiment. Use your value for k to determine, to the *nearest tenth of an hour*, how much time she must wait since she first began the experiment.

Question 37

37 Megan is performing an experiment in a lab where the air temperature is a constant 73°F and the liquid is 237°F. One and a half hours later, the temperature of the liquid is 112°F. Newton's law of cooling states $T(t) = T_a + (T_0 - T_a)e^{-kt}$ where:

73) 164 237

112) 125

$T(t)$: temperature, °F, of the liquid at t hours
T_a: air temperature
T_0: initial temperature of the liquid
k: constant

Determine the value of k, to the *nearest thousandth*, for this liquid.

$112 = 73 + (237 - 73)e^{-k\frac{1}{2}}$

$112 = 73 + (164)e^{-k\frac{1}{2}}$

$112 = 237e^{-k\frac{1}{2}}$

$\log 112 = -k\frac{1}{2} \log 237$

$\frac{\log 112}{\log 237} = -k\frac{1}{2}$ $\quad k = -1.726$

Question 37 is continued on the next page.

Score 0: The student did not show enough relevant course-level work to receive any credit.

Question 37

Determine the temperature of the liquid using your value for k, to the *nearest degree*, after two and a half hours.

$T(t) = 73 + (237 - 73)e^{-.863}$

$T(T) = 73 + 164e^{-.863}$

$T(T) = 237 e^{-.863}$

$T(T) = -.863 \log(237)$

$T(T) = -2$

Megan needs the temperature of the liquid to be 80°F to perform the next step in her experiment. Use your value for k to determine, to the *nearest tenth of an hour*, how much time she must wait since she first began the experiment.

$80 = 237 e^{-1.726T}$

$\log 80 = -1.726t \log(237)$

$1.903 = -1.726T(2.37)$

$1.903 = T(-4.09)$

$T =$ 2 hours and 19 minuts

Question 37

37 Megan is performing an experiment in a lab where the air temperature is a constant 73°F and the liquid is 237°F. One and a half hours later, the temperature of the liquid is 112°F. Newton's law of cooling states $T(t) = T_a + (T_0 - T_a)e^{-kt}$ where:

$T(t)$: temperature, °F, of the liquid at t hours
T_a: air temperature
T_0: initial temperature of the liquid
k: constant

Determine the value of k, to the *nearest thousandth*, for this liquid.

$T(t) = Ta + (T0 - Ta)e^{-kt}$

$112(1.5) = 73 + (237 - 73)e^{-k(1.5)}$

$106 = 73 + (164)e^{-k(1.5)}$

.644

Question 37 is continued on the next page.

Score 0: The student did not show enough relevant course-level work to receive any credit.

Question 37

Determine the temperature of the liquid using your value for k, to the *nearest degree*, after two and a half hours.

237 - 112 = 125

1 1/2 hrs = −125 | 112

125 ÷ 3 ≈ 42

42 • 2 = 84

84 = 1 hr

112 − 84 = 28

28°F

Megan needs the temperature of the liquid to be 80°F to perform the next step in her experiment. Use your value for k to determine, to the *nearest tenth of an hour*, how much time she must wait since she first began the experiment.

2 hours

1 1/2 hrs = −125 | 112

125 | 3 ≈ 42

42 • 2 = 84

84 = 1 hr

42 = 30 min

112 − 42 = 70

The State Education Department / The University of the State of New York

Regents Examination in Algebra II – June 2024

Chart for Converting Total Test Raw Scores to Final Exam Scores (Scale Scores)

(Use for the June 2024 exam only.)

Raw Score	Scale Score	Performance Level
86	**100**	5
85	**99**	5
84	**98**	5
83	**97**	5
82	**95**	5
81	**95**	5
80	**94**	5
79	**93**	5
78	**92**	5
77	**91**	5
76	**90**	5
75	**90**	5
74	**89**	5
73	**88**	5
72	**88**	5
71	**87**	5
70	**87**	5
69	**86**	5
68	**86**	5
67	**85**	5
66	**84**	4
65	**84**	4
64	**84**	4
63	**83**	4
62	**83**	4
61	**82**	4
60	**82**	4
59	**82**	4
58	**81**	4

Raw Score	Scale Score	Performance Level
57	**81**	4
56	**81**	4
55	**80**	4
54	**80**	4
53	**80**	4
52	**79**	4
51	**79**	4
50	**79**	4
49	**78**	4
48	**78**	4
47	**78**	4
46	**77**	3
45	**77**	3
44	**77**	3
43	**76**	3
42	**76**	3
41	**75**	3
40	**75**	3
39	**74**	3
38	**74**	3
37	**73**	3
36	**73**	3
35	**72**	3
34	**71**	3
33	**71**	3
32	**70**	3
31	**69**	3
30	**68**	3
29	**68**	3

Raw Score	Scale Score	Performance Level
28	**67**	3
27	**66**	3
26	**65**	3
25	**63**	2
24	**62**	2
23	**61**	2
22	**59**	2
21	**58**	2
20	**55**	2
19	**54**	1
18	**53**	1
17	**51**	1
16	**49**	1
15	**47**	1
14	**45**	1
13	**43**	1
12	**40**	1
11	**38**	1
10	**35**	1
9	**32**	1
8	**29**	1
7	**26**	1
6	**23**	1
5	**19**	1
4	**16**	1
3	**12**	1
2	**8**	1
1	**4**	1
0	**0**	1

To determine the student's final examination score (scale score), find the student's total test raw score in the column labeled "Raw Score" and then locate the scale score that corresponds to that raw score. The scale score is the student's final examination score. Enter this score in the space labeled "Scale Score" on the student's answer sheet.

Schools are not permitted to rescore any of the open-ended questions on this exam after each question has been rated once, regardless of the final exam score. Schools are required to ensure that the raw scores have been added correctly and that the resulting scale score has been determined accurately.

Because scale scores corresponding to raw scores in the conversion chart change from one administration to another, it is crucial that for each administration the conversion chart provided for that administration be used to determine the student's final score. The chart above is usable only for this administration of the Regents Examination in Algebra II.