

The University of the State of New York

244TH HIGH SCHOOL EXAMINATION

ADVANCED ALGEBRA

Thursday, January 24, 1929—9.15 a. m. to 12.15 p. m., only

Instructions

Do not open this sheet until the signal is given.

Answer all questions in part I and five questions from part II.

Part I is to be done first and the maximum time to be allowed for this part is one and one half hours. Merely write the answers to each question in the space at the right; no work need be shown.

If you finish part I before the signal to stop is given you may begin part II. However, it is advisable to look your work over carefully before proceeding to part II, since *no credit will be given any answer in part I which is not correct and reduced to its simplest form.*

When the signal to stop is given at the close of the one and one half hour period, work on part I must cease and this sheet of the question paper must be detached. The sheets will then be collected and you should continue with the remainder of the examination.

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Fill in the following lines:

Name of school _____ Name of pupil _____

Detach this sheet and hand it in at the close of the one and one half hour period.

Part I

Answer all questions in this part. Each question has 2½ credits assigned to it; no partial credit should be allowed. Each answer must be reduced to its simplest form.

- 1 Find the sum of the infinite geometric series $2, 1, \dots$ Ans.
- 2 Using one of the relations between roots and coefficients, find the arithmetic mean between the roots of $3x^2 - 18x + 7 = 0$ Ans.
- 3 If $y^2 - 4xy + 1 = 0$, solve the equation for y in terms of x ; that is, find the function of x defined by the equation. Ans.
- 4-8 Given the equation $3x^4 - x^3 + x^2 - 5 = 0$
 - a What is the maximum number of positive roots? Ans.
 - b What is the minimum number of positive roots? Ans.
 - c What is the exact number of negative roots? Ans.
 - d What is the maximum number of complex roots? Ans.
 - e What is the sum of the roots? Ans.
- 9 Express in the form of a polynomial in x equated to zero the equation whose roots are $1, 0, i, -i$. Ans.
- 10 Express $\frac{7+i}{3-i}$ in the form $a + bi$ Ans.
- 11 What is the distance between the points representing $2 + i$ and $5 + 5i$? Ans.
- 12 Transform $3x^2 + 2x - 1 = 0$ into an equation with integral coefficients, that of the highest-degree term being unity. Ans.
- 13 Transform $x^2 - 5x - 7 = 0$ into an equation whose roots are 2 less than the roots of the given equation. Ans.
- 14 Write the first three terms of the expansion of $(1 + x)^6$ Ans.
- 15 Find the values of x for the three points at which the graph of $y = x^3 - 4x$ cuts the x -axis. Ans.
- 16 In how many ways can a club of 10 students elect a president, a secretary and a treasurer? Ans.
- 17 In how many ways can a committee of 3 be appointed if 2 members are chosen from a class of 40 students and the third from a class of 20? Ans.
- 18 If $y = 10^{2x}$, find x in terms of y . Ans.
- 19 Find by the use of logarithms the value of $\sqrt[3]{593}$ to the nearest tenth. Ans.
- 20 If x is one side of a rectangle whose perimeter is 12, express the area as a function of x . Ans.

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Write at top of first page of answer paper (a) name of school where you have studied, (b) number of weeks and recitations a week in (1) elementary algebra, (2) intermediate algebra, (3) advanced algebra. The minimum time requirement is five recitations a week in algebra for two school years.

Part II

Answer five questions from this part. Full credit will not be granted unless all operations (except mental ones) necessary to find results are given; simply indicating the operations is not sufficient. Each answer should be reduced to its simplest form.

In the examination in advanced algebra the use of the slide rule will be allowed for checking, provided all computations with tables are shown on the answer paper.

21 Find the four roots of $3x^4 + 5x^3 + 7x^2 + 15x - 6 = 0$ [10]

22 Find to the nearest tenth the positive root of $x^3 - 8x - 6 = 0$ [10]

23 In the equation $x^3 - x^2 - 4x + k = 0$, find the integral value of k that will make one root double the other. [10]

24 If interest is compounded annually at 5%, in how many years will \$400 amount to \$1150? [10]

25 The length of a rectangular plot of ground is twice the width. The plot consists of a rectangular flower bed and a walk of uniform width surrounding it. The length of the flower bed is three times the width and the area of the walk is 180 square feet. Find the area of the flower bed. [7, 3]

26 A starts from a city R for a city S 3 hours before B leaves S for R . Each travels at a uniform rate. When they meet, A has gone 40 miles farther than B , and each finishes his journey in 2 hours. Find the rate of each. [7, 3]

27 Two locomotives are moving on double tracks near a signal post. During an interval of 6 seconds from $t = 0$ to $t = 6$ their distances from the signal post in yards are given by the formulas $d = 20 + 8t - 2t^2$ and $d = 10t - 40$

a Plot the graph of these formulas on the same axes from $t = 0$ to $t = 6$ inclusive, plotting values of t along the horizontal axis and values of d along the vertical axis. [6]

b What is the distance between the locomotives when we begin to consider their motion? [1]

c What is the greatest distance from the post to the first locomotive during these 6 seconds? [1]

d When does the second locomotive pass the post? [1]

e When do the locomotives pass each other? [1]