

223D HIGH SCHOOL EXAMINATION

INTERMEDIATE ALGEBRA

Monday, June 14, 1920—9.15 a. m. to 12.15 p. m., only

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.

The minimum time requirement is four recitations a week for half a school year, after the completion of elementary algebra.

Answer eight questions, four from group I and four from group II, including either question 6 or question 7. Credits 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.

Group I

Answer four questions from this group.

- 1 Find the prime factors of each of the following:

$$a^2 - 4x^2 + 4x - 1 \quad [2\frac{1}{2}]$$

$$8x^3 + 29x^2 - 12x \quad [2\frac{1}{2}]$$

$$(a-b)^2 - 3(a-b) - 4 \quad [2\frac{1}{2}]$$

$$y^3 - 4y^2 + y + 6 \quad [2\frac{1}{2}]$$

$$a^{12} - 64b^6 \quad [2\frac{1}{2}]$$

- 2 a Find the value of
- $\frac{3x^3 - 2x - 7}{2x^2 - 1}$
- when
- $x = -\frac{3}{2}$
- [5]

- b Write as a single fraction in its lowest terms:

$$\left(\frac{4a-10}{a^2-5a+6} + \frac{3}{3-a}\right) \div \left(1 - \frac{a+1}{a^2-2a-3}\right)$$

Addition [4], division [3]

- 3 Without solving any of the following equations select one that has (a) equal roots, (b) real and unequal roots, (c) imaginary roots; state the reason for each selection:

$$x^2 + 6 = x$$

$$4x^2 + 20x = -25$$

$$2x^2 = 5x + 18 \quad [12\frac{1}{2}]$$

- 4 a Rationalize the denominator and express the result in its simplest form: [5]

$$\frac{2\sqrt{10}-5}{\sqrt{5}+2\sqrt{2}}$$

- b Write in simplest form:

$$6\sqrt{4\frac{1}{2}} - \sqrt{96} - \sqrt{\frac{1}{3}} - \frac{1}{4}\sqrt{\frac{3}{8}} + \frac{1}{3}\sqrt{-48} \quad [7\frac{1}{2}]$$

INTERMEDIATE ALGEBRA—concluded

5 a Write the value of $64^{-\frac{1}{2}} - 3(13)^0 + 12(2)^{-2}$ [6]

b Divide $e^{2x} + 2 + e^{-2x}$ by $e^x + e^{-x}$ [6]

Group II

Answer four questions from this group, including either question 6 or question 7.

- 6 A crew can row 8 miles down a stream and back in 3 hours and 40 minutes; if the rate of the stream is
- $2\frac{1}{2}$
- miles an hour, find the rate of the crew in still water. Equation [7], solution [5]

- 7 A corner building lot, rectangular in shape, contained 9600 square feet. After a sidewalk 6 feet wide had been built on one side and the front, the area of the lot was reduced to 8316 square feet. Find the original length and width. Equation [7], solution [5]

- 8 Form the equation whose roots are
- $\frac{m+\sqrt{n}}{2}$
- and
- $\frac{m-\sqrt{n}}{2}$
- . Solve this equation by the formula and thereby test the correctness of the equation you have formed. [12]

- 9 Solve the following and correctly group your answers:
-
- $$\begin{cases} 2x^2 + xy = 15 \\ x^2 - y^2 = 8 \end{cases} \quad [12\frac{1}{2}]$$

- 10 Draw the graph of the equation
- $x^2 - 4x + 2 = y$
- from
- $x = -1$
- to
- $x = +5$
- . From this graph read the roots of the equation
- $x^2 - 4x + 2 = 0$
- to the nearest tenth. [Leave all work on the paper.] Making graph [8], estimating roots [4]

- 11 Answer either a or both b and c:

- a Derive a fundamental formula for the sum of
- n
- terms of a geometric progression. [12]

Or

- b Prove:
- $\log a^p = p \log a$
- [3]

- c By the use of logarithms find the value of

$$\frac{(.846)^2 \times \sqrt{18.7}}{3.42} \quad [9]$$

- 12 In the formula
- $C = \frac{S \times E}{S \times b + R}$

- a Solve for
- S
- in terms of the other letters. [6]

- b Find the value of
- C
- to the nearest hundredth if
- $S = 4$
- ,
- $E = 1.07$
- ,
- $b = 2.4$
- ,
- $R = 27$
- . [6]

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DIRECTIONS FOR RATING

The direction, "Less than 60% of the credit should be granted when an error in computation occurs," should be followed in rating all incorrect answers to questions which fall under the topics mentioned in "Suggestions on the Rating of Regents Examination Papers in Mathematics" under "General 3."

In rating all problems, see "Suggestion 12."

No credit should be allowed for checks unless made in original statements.

Except in schools where the "committee system" is used, teachers are urged to mark papers cumulatively, that is, to add the credits earned by each answer to the total credits earned by preceding answers so that the mark given to the last answer is the per cent to which the paper is entitled, e. g. consecutive answers earning 5, 7, 4 etc. respectively should be marked 5, 12, 16 etc. respectively.

- 1 $12\frac{1}{2}$ credits
Allow $2\frac{1}{2}$ credits each.
Allow no partial credit on any part.
- 2 $12\frac{1}{2}$ credits
a 5 credits. Allow no partial credit.
b $7\frac{1}{2}$ credits. Allow 4 credits for correct addition and $3\frac{1}{2}$ credits for correct division. Allow no partial credit on either part.
- 3 $12\frac{1}{2}$ credits
a 4 credits
b 4 credits
c $4\frac{1}{2}$ credits
Allow no partial credit on a, b or c.
- 4 $12\frac{1}{2}$ credits
a 5 credits
b $7\frac{1}{2}$ credits
Allow no partial credit on either part.
- 5 $12\frac{1}{2}$ credits
a 6 credits
b $6\frac{1}{2}$ credits
Allow no partial credit on either part.

DIRECTIONS FOR RATING—concluded

- 6 $12\frac{1}{2}$ credits
Allow $7\frac{1}{2}$ credits for correct equation and 5 credits for correct solution.
- 7 $12\frac{1}{2}$ credits
Allow $7\frac{1}{2}$ credits for correct equation and 5 credits for correct solution.
- 8 $12\frac{1}{2}$ credits
Allow 5 credits for the correct equation and $7\frac{1}{2}$ credits for the correct solution by formula.
- 9 $12\frac{1}{2}$ credits
Allow $6\frac{1}{2}$ credits for first solution and $4\frac{1}{2}$ credits for the other three solutions ($1\frac{1}{2}$ each).
Allow $1\frac{1}{2}$ credits for correct grouping.
- 10 $12\frac{1}{2}$ credits
Allow 8 credits for the graph.
Allow $4\frac{1}{2}$ credits for estimating, from the graph, the roots to the nearest tenth.
- 11 $12\frac{1}{2}$ credits
a $12\frac{1}{2}$ credits
Or
b $3\frac{1}{2}$ credits
c 9 credits
- 12 $12\frac{1}{2}$ credits
a Allow 6 credits
b $6\frac{1}{2}$ credits
Allow no partial credit on either part.