

The University of the State of New York

247TH HIGH SCHOOL EXAMINATION

ADVANCED ALGEBRA

Thursday, January 23, 1930—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.

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|---|----------|
| 1 The sum of an infinite geometric series is 12 and the ratio is $\frac{1}{2}$; what is the first term? | Ans..... |
| 2 Find by the use of logarithms the value of $\sqrt[3]{375}$ to the nearest tenth. | Ans..... |
| 3 Find the positive integral root of the equation $x^3 - 2x^2 - 3x + 6 = 0$ | Ans..... |
| 4 Using <i>one</i> relation between roots and coefficients, find the positive geometric mean between the roots of $2x^2 - 17x + 14 = 0$ | Ans..... |
| 5-8 Given the equation $2x^4 + 3x^3 - x^2 + 5x + 5 = 0$ | |
| a What is the possible maximum number of positive roots? | Ans..... |
| b What is the possible maximum number of negative roots? | Ans..... |
| c What is the possible maximum number of complex roots? | Ans..... |
| d What is the sum of the roots? | Ans..... |
| 9 Write in the form $x^2 + px + q = 0$, the equation whose roots are $2 + i$ and $2 - i$ | Ans..... |
| 10 Write the <i>fifth</i> term of the expansion $(1 - x)^5$ | Ans..... |
| 11 If $y^2 + 4y + 4 - x^2 = 0$, express y as a function of x ; that is, solve the equation for y in terms of x . | Ans..... |
| 12 Find an equation whose roots are 2 less than the roots of $x^2 - 3x - 7 = 0$ | Ans..... |
| 13 Transform $2x^3 - 3x^2 - 1 = 0$ into an equation with integral coefficients, the coefficient of the term of highest degree being unity. | Ans..... |
| 14 Express $\frac{2i}{1+i}$ in the form $a + bi$ | Ans..... |
| 15 What kind of number is the sum of two conjugate imaginary numbers? | Ans..... |
| 16 With four flags of different colors, how many different signals can be made by displaying two flags, one above the other? | Ans..... |
| 17 Solve for x by the use of logarithms: $a^{bx} = c$ | Ans..... |
| 18 If the graph of $y = ax^2 - 2x$ passes through the point $(2, 8)$, what is the value of a ? | Ans..... |
| 19 A man lives 10 miles from town. He starts from his home and walks toward the town at a uniform rate of 3 miles an hour. If t is the number of hours he has walked, express his distance (d) from the town as a function of t . | Ans..... |
| 20 For what value of a will the graph of $y = x^2 + 4x + a$ be tangent to the x -axis? | 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 three roots of the equation $3x^3 + 4x^2 - 19x + 10 = 0$ [10]
- 22 Find to the nearest tenth the real root of $x^3 + 2x - 18 = 0$ [10]
- 23 In the equation $x^3 - 4x^2 - x + k = 0$, find the integral value of k for which two of the roots will differ by 3. [10]
- 24 A man deposits \$5000 in a trust company paying 4% interest, compounded annually. At the end of 10 years he withdraws \$2000. What balance will he have in the bank (a) immediately after making the withdrawal, (b) 10 years after making the withdrawal? [6, 4]
- 25 The edges of three cubes are in arithmetic progression. The sum of these edges is 15 and the sum of the areas of the cubes is 498. Find an edge of each cube. [4, 6]
- 26 Two men, A and B, plan to drive from the same place to a point 180 miles distant. Both drive at uniform rates. A leaves at noon and B leaves x hours later. At 2 o'clock A is 20 miles ahead of B and at 4 o'clock B is 20 miles ahead of A. B reaches the destination 3 hours before A. At what time did B start? [7, 3]
- 27 For the first 6 minutes of the second quarter of a football game the distance in yards from the line of scrimmage of one team to the opponent's goal is given approximately by the formula $d = -t^3 + 9t^2 - 24t + 36$
- a Plot the graph of this formula for values of t from $t = 0$ to $t = 6$ inclusive. [6]
- b How far was the ball from the goal at the beginning of the second quarter? [1]
- c How long was the team forced back during this 6-minute interval? [1]
- d How far was the ball from the goal when the team again started to advance the ball? [1]
- e How many minutes after the beginning of the second quarter did the team make a touch-down? [1]