The University of the State of New York

228TH HIGH SCHOOL EXAMINATION

ADVANCED ALGEBRA

Monday, January 22, 1923—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, (3) advanced algebra.

The minimum time requirement is five recitations a week in algebra for two school years.

Answer eight questions. 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.

1 Given the polynomial $2x^3 - 6x^2 + 100$; calculate its value when $x = 4 + 3i$ and represent the result graphically. $[i = \sqrt{-1}]$ [10, 2½]

2 Solve the following equation for x:

$$577 = 455(1.02)^{2x}$$ [12½]

3 *a* Derive a formula for the sum of n terms of an infinite decreasing geometric progression in terms of a and r. [6]

b Express as an ordinary fraction the repeating decimal 0.1313 . . . [6½]

4 *a* State Descartes' rule of signs for positive and negative roots of an equation. [2]

b By the use of this rule and by inspection of the constant term, obtain all the information possible concerning the roots of $4x^5 - 2x - 1 = 0$ [4½]

c Without expanding $(2x^2 - \frac{1}{2}x^{-1})^{10}$, find the seventh term and simplify the result. [6]

5 *a* Transform $4x^3 - 12x^2 - x + 3 = 0$ into an equation with integral coefficients, the coefficient of the highest degree term being unity. [7½]

b Solve the resulting equation and from these results write the roots of the original equation. [5]

6 One root of the equation $x^3 - 9x^2 + kx - 65 = 0$ is $2 - 3i$; find the other roots and the value of k. [12½]

7 Find the positive root of $x^3 + 9x^2 + 27x - 50 = 0$ correct to the *nearest* hundredth. [12½]

8 *a* Plot the graph of $y = \frac{1}{2}x^3 - x^2 - 2x + 2$ from $x = -2$ to $x = +3$ [7½]

b From the graph estimate the roots of

$$\frac{1}{2}x^3 - x^2 - 2x + 2 = 0$$ [2]

c From the graph determine the roots of

$$\frac{1}{2}x^3 - x^2 - 2x + 2 = -2$$ [3]

9 A box contains 7 red cards, 6 white cards and 4 blue cards; how many selections of three cards can be made so that (*a*) all three are red, (*b*) none are red? [6, 6½]

10 A certain principal and interest for one year amount to \$132.50; if the principal were \$25 more and the rate of interest 1% less, the amount in one year would be \$157.50. Find the principal and the rate of interest. [12½]