The University of the State of New York

EXAMINATION FOR QUALIFYING CERTIFICATES

ADVANCED ALGEBRA

Monday, September 9, 1918—9.15 a. m. to 12.15 p. m., only

Answer eight questions. Each answer should be reduced to its simplest form. Papers entitled to less than 75 credits will not be accepted.

1 Compute by Horner's method to *two* decimal places one root of the equation $x^4-5x^3+4x^2+1=0$

2 *a* How many parties, each consisting of 1 sergeant, 2 corporals and 5 privates, can be formed from 3 sergeants, 8 corporals and 16 privates?

b How many permutations can be made of the letters in the word New York, each one beginning with N?

3 If one root of the equation $x^4-4x^3+5x^2+8x-14=0$ is $2+i\sqrt{3}$, solve the equation.

4 By the use of Descartes' rule of signs, determine the nature of the roots of the following:

$x^5+x^2+1=0$

$x^4+1=0$

$x^4-x^2-1=0$

5 The equations

$x^4+x^3-x-1=0$ and $x^4+x^3+2x^2+x+1=0$

have roots in common. Solve both equations.

6 Plot the graph of the equation

$x^4+5x^3+x^2-13x-7=y$

and from the graph estimate to the nearest tenth the roots of the left member set equal to zero.

7 Prove that if $a+ib$ is a root of an equation with real coefficients, $a-ib$ is also a root of the equation.

8 An army truck going from Buffalo to New York travels at the rate of 12 miles an hour. After traveling $2\frac{1}{2}$ hours it is delayed $1\frac{1}{2}$ hours by an obstruction on the road; it then proceeds at its former rate. Three hours after the first truck starts a second one follows at the rate of 15 miles an hour. How far will they travel before the second overtakes the first? [Solve graphically.]

9 Transform the equation $x^4-4x^3-18x^2-3x+2=0$ into one lacking the third term.

10 A man lends $2100 in two amounts at different rates of interest, and the two sums produce equal returns. If the first portion had been lent at the second rate it would have produced $48; if the second portion had been lent at the first rate it would have produced $27. Find the rates.