The University of the State of New York

EXAMINATION FOR QUALIFYING CERTIFICATES

ADVANCED ALGEBRA

Monday, September 12, 1921—9.15 a. m. to 12.15 p. m., only

Answer eight questions, including at least two from group II. Each answer should be reduced to its simplest form. Papers entitled to less than 75 credits will not be accepted.

Group I

1 Find the values of x in the following [Logarithms may be used]:

a $7^{2x^2-15x}=49^4$

b $x=\dfrac{(.352)^4\times\sqrt[3]{400}}{.002587}$

2 Find to the *nearest tenth* the positive root of the equation $2x^3+x^2-9x-6=0$

3 In how many ways can two numbers whose sum is even be chosen from the numbers 1, 4, 6, 7, 10 and 12?

4 *a* Without solving, transform the equation

$$2x^3+x^2-13x+6=0$$

into an equation whose roots are 2 less than the roots of the given equation.

b Solve the resulting equation and from the roots thus obtained, determine the roots of the given equation.

5 Form a rational integral equation of the lowest degree possible, two of whose roots shall be

$$2-\sqrt{-3} \text{ and } -1+\sqrt{2}$$

6 Without solving, determine the nature of the roots of *each* of the following [Show all the work]:

a $x^2-3ax+3a^2=0$

b $4x^2+9=12x$

c $3ax^2-(2a+3b)x+2b=0$

d $3x^2+5x-1=0$

7 Plot the graph of $x^3+3x^2-2x-1=y$ between the values $x=-4$ and $+2$, and from the graph determine to the *nearest tenth* the roots of the equation $x^3+3x^2-2x=1$

Group II

Answer at least two questions from this group.

8 Find a number such that its square diminished by 7 equals 19 times the excess of the number over 5.

9 Fifty-five logs are to be piled so that the top layer shall consist of 1 log, the next layer of 2 logs, the next layer of 3 logs, etc. By the use of formulas find how many logs must be placed in the bottom layer.

10 How many pounds of coffee costing 70 cents a pound must be combined with 15 pounds costing 45 cents a pound to form a mixture with an average cost of 50 cents a pound?

11 A rectangular mirror is in a frame 4 inches wide. If the area of the mirror is 972 square inches and that of the frame 568 square inches, find the length and the width of the mirror.