The University of the State of New York

EXAMINATION FOR QUALIFYING CERTIFICATES

ADVANCED ALGEBRA

Monday, September 11, 1922—1.15 to 4.15 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 *a* Find by the aid of logarithms the value of $5\sqrt[3]{\frac{75\times193^4}{5863}}$

b Find the values of x in the equation $a^{3x^2+x}=a^2$

2 *a* Rationalize the denominator of the fraction $\frac{2+3\sqrt{-2}}{2-3\sqrt{-2}}$

b Add graphically $4+3\sqrt{-1}$ and $-5-2\sqrt{-1}$

3 Find the real values of k for which the following set of equations has only *one* solution:

$$x^2+y^2=9$$
$$x-2y=k$$

4 *a* In how many ways can 9 apples be divided among three boys so that one boy will receive 4, another 3 and the third 2?

b How many words can be made out of 2 vowels and 2 consonants if each arrangement of the four letters is considered a word?

5 Find correct to *two* decimal places the positive root of the equation $2x^3+x^2-15x-59=0$

6 A rectangular garden is surrounded by a walk 1 yard wide; the length of the garden itself is 4 yards more than its width. If the area of the garden and walk together is 96 square yards, find the dimensions of the garden.

7 Transform the equation $x^3-6x^2+4x-1=0$ into an equation whose second term is lacking.

8 A boy starts a bank account by depositing \$3. For the next eleven weeks he increases the amount of his deposits by 25 cents each week. Thereafter he puts in the bank weekly a sum equal to the twelfth deposit, until his account totals \$133. How many deposits in all does he make?

9 *a* Without solving, determine the character of the roots of the equation $4x^6+x^3+1=0$

b One root of the equation $2x^4-11x^3+17x^2-10x+2=0$ is $2+\sqrt{2}$. Solve for the other roots.

10 Two men, A and B, can do a piece of work together in $7\frac{1}{2}$ days; A working alone needs 8 days more than B to complete it. How many days will it take B alone to do the work?

11 Solve graphically the following set of equations, indicating the roots at the corresponding points of intersection:

$$x^2+y^2=25$$
$$y^2=3x+9$$