

ADVANCED ALGEBRA

Monday, January 19, 1914—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. 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.

1 Given $(9x + 5k^2)(x + k) = 2x$

Determine k so that (a) the roots may be equal numerically but opposite in sign, (b) one root may equal 0.

2 a What value must k have in order that one root of the equation $x^2 - 3kx - 2k + 4 = 0$ may equal 2?

b Find the equation whose roots are double the roots of $x^2 + ax + b = 0$

3 Show by substitution that $1 + i$ is a root of the following:
 $2x^3 - x^2 - 2x + 6 = 0$

4 Express the following sum as a single determinant and evaluate it:

$$\begin{vmatrix} 15 & 2 & 6 & 1 \\ -5 & 0 & 4 & 8 \\ 2 & 7 & 3 & 10 \\ 8 & 8 & 2 & 2 \end{vmatrix} + \begin{vmatrix} -10 & 2 & 6 & 1 \\ 5 & 0 & 4 & 8 \\ 7 & 7 & 3 & 10 \\ 2 & 8 & 2 & 2 \end{vmatrix}$$

5 How many parallelograms are formed when a set of 10 parallel lines intersects another set of 8 parallel lines?

6 Form an equation of the fourth degree, two of whose roots are $1 + 2i$ and $-\sqrt{2}$

7 Solve $x^3 - 12x^2 + 23x + 36 = 0$ if the roots are in arithmetical progression.

8 Prove that if a is a root of the equation $f(x) = 0$, then $x - a$ is a factor of $f(x)$.

9 Solve $3x^3 + 16x^2 + 18x - 20 = 0$

10 Plot the equation $x^3 - 2x - 2 = y$. Compute by Horner's method, to two places of decimals, the positive root of the left member of this equation set equal to zero.