*The University of the State of New York*

212TH HIGH SCHOOL EXAMINATION

# ADVANCED ALGEBRA

**Monday**, January 18, 1915—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.*

1 For what value of $k$ is the sum of the roots of the equation $x^2+(4-6k)x+k^2=0$ equal to twice their product? Check your result.

2 Solve the equations $\begin{cases} x^2+y^2=8 \\ x+y=k \end{cases}$ What relation do the graphs of these equations bear to each other for (*a*) $k=4$, (*b*) $k<4$, (*c*) $k>4$?

3 If $m$ and $n$ are the roots of the equation $ax^2+bx+c=0$, find the equation whose roots are $\frac{m}{n}$ and $\frac{n}{m}$.

4 *a* Three ladies and four gentlemen are to play one game of tennis, each side to consist of a lady and a gentleman; in how many ways can the sides be arranged?

*b* $A$ and $B$ are members of a militia company of 72 men; if the company is divided into squads of 6, how many arrangements may be made in which $A$ and $B$ will be in the same squad?

5 Transform $x^4-2x^3+x^2-x+1=0$ into an equation lacking the term in $x^3$ and state by how much the roots of the new equation differ from the roots of the given equation.

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

7 Prove that the equation $x^n+a_1x^{n-1}+\ \ldots\ +a=0$ can not have more than $n$ roots.

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

9 An open box is to be made from a rectangular piece of tin 9″ long and 7″ wide, by cutting out equal squares from the corners and turning up the sides; how large should these squares be in order that the box may contain 35 cu. in.?

10 *a* Resolve into prime factors $x^9-64x^3-x^6+64$

*b* By what must $a^{\frac{1}{2}}-b^{\frac{3}{4}}$ be multiplied in order that the product may be rational?

*c* $A$ can do a piece of work in $a$ days, $B$ the same work in $b$ days and $C$ the same work in $a+b$ days; how many days will it take them to do the work if all work together?