

## ADVANCED ALGEBRA

Tuesday, January 23, 1906—9.15 a. m. to 12.15 p. m., only

*Answer eight questions but no more. Give each step of solution. Reduce fractions to lowest terms. Express final result in its simplest form and mark it Ans. Each complete answer will receive 10½ credits. Papers entitled to 75 or more credits will be accepted.*

1 Define logarithm, mixed surd, identical equation, variation, exponential equation.

2 Change the following to equivalent expressions having positive exponents and expand each expression:  $(\frac{1}{2}x^{-2} + 2x^2)^2$ ;  $(\frac{3x}{2} - \frac{y}{3})^{-2}$

3 A, B and C travel from the same place at the rates of 4, 5 and 6 miles an hour respectively, and B starts 2 hours later than A; how long after B must C start in order that they may both overtake A at the same moment?

4 Solve  $x^2 - 2mx + 3m^2 = 5$ . State what values must be given to  $m$  to make the roots (a) real and equal, (b) imaginary and unequal.

5 Resolve into partial fractions  $\frac{4x^2 - 1}{(x+1)^2}$

6 How many different collections of letters can be made from the letters of the word *universal*, each collection consisting of 2 vowels and 3 consonants?

7 Solve  $x^4 - 6x^3 + 12x^2 - 10x + 3 = 0$

8 Solve  $\begin{cases} 2^x = 5 \\ 3^x = 2^x y \end{cases}$

9 By synthetic division divide  $y^4 + 3y^3 + 10y^2 - 11y - 6$  by  $y^2 + 4y + 3$

10 Transform  $2x^3 - x^2 + \frac{5}{6}x - \frac{2}{3} = 0$  into an equation whose roots are 3 times the roots of the given equation, the first coefficient being unity.

11 In a geometric series of 5 terms the difference between the first and the fifth term is 100; the difference between the second and the fourth term is 48. Find each term of the series.

12 Applying determinants solve  $\begin{cases} x + y - z = 1 \\ -4x - y + 3z = 1 \\ 7x + 3y - 5z = 3 \end{cases}$