

## High School Department

172D EXAMINATION

## ADVANCED ALGEBRA

Tuesday, January 28, 1902—9.15 a. m. to 12.15 p. m., only

*Answer eight questions but no more. If more than eight are answered only the first eight answers will be considered. 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 12½ credits. Papers entitled to 75 or more credits will be accepted.*

1 In any system of logarithms, express the logarithm of  
a) unity, b) the base, c) zero. Give proof for each case.

2 Solve  $2\sqrt[n]{x} + 2x^{-\frac{1}{n}} = 5$

3 Expand by the binomial theorem  $(1+2x)^{-\frac{1}{2}}$  to five terms.

4 How many different parties, each consisting of 3 soldiers and 4 sailors, can be formed out of 12 soldiers and 16 sailors?

5 Derive a formula for determining the value of the ratio when the extremes and the number of terms are known. Insert four geometric means between 486 and 2.

6 One of the roots of the equation  $x^4 - 4x^3 - 8x + 32 = 0$  is  $-1 + \sqrt{-3}$ ; find the other three roots of the equation.

7 Transform  $x^4 + 4x^2 + 3x + 5 = 0$  into an equation whose roots are double the roots of the given equation but have opposite signs.

8 Prove by a general method that the successive convergents of a continued fraction are alternately less and greater than the true value of the continued fraction.

9 By the method of differences find the 12th term of the series 4, 11, 28, 55, 92 etc.

10 Revert to four terms  $y = x + 3x^2 + 5x^3 + 7x^4 + \dots$

11 Prove that a factor can be found that will rationalize any binomial surd.

12 Apply determinants in the solution of 
$$\begin{cases} 3x + 4y = 18 \\ x + 2y = 8 \end{cases}$$