

High School Department

167TH EXAMINATION

ADVANCED ALGEBRA

Tuesday, January 22, 1901—9.15 a. m. to 12.15 p. m., only

Answer 10 questions but no more. If more than 10 are answered only the first 10 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 10 credits. Papers entitled to 75 or more credits will be accepted.

1 Define *five* of the following: cubic equation, commensurable root, conjugate imaginaries, series, harmonic progression, continued proportion.

2 Divide $\sqrt[3]{x^2+2x^{\frac{1}{2}}-16x^{-\frac{2}{3}}-\frac{32}{x}}$ by $x^{\frac{1}{3}}+4x^{-\frac{1}{3}}+\frac{4}{\sqrt{x}}$

3 Find the sixth root of the following expression:
 $1+6x+15x^2+20x^3+15x^4+6x^5+x^6$

4 The number of square inches in the surface of a cube exceeds the number of linear inches in the sum of its edges by 210; find the volume of the cube.

5 Interpret the forms $\frac{a}{0}$, $\frac{a}{\infty}$, $\frac{0}{0}$

6 Find the square root of $a+b+\sqrt{2ab+b^2}$

7 How many different combinations of letters, each consisting of four consonants and one vowel, can be formed from 12 consonants and 3 vowels?

8 If A , G and H are respectively the arithmetic, geometric and harmonic means between a and b , prove that G is the geometric mean between A and H . Find the harmonic mean between 4 and 12.

9 Find by the binomial theorem the value of $\sqrt[4]{83}$ to *four* places of decimals.

10 Express $\frac{729}{2318}$ as a continued fraction and find its fourth convergent.

11 Expand $\sqrt{a^2-x^2}$ to *four* terms.

12 Resolve into partial fractions $\frac{4x-5x^2-21}{x^3-4x^2+x-4}$

13 Solve by use of logarithms $3^{x+2}=405$ ($\log. 3=.4771$, $\log. 5=.6990$).

14 State Descartes's rule of signs and apply it to determine the nature of the roots of $3x^4+12x^2+5x-4=0$

15 Transform the following equation into another whose coefficients are integral, that of the first term being unity:

$$2x^3-\frac{3}{2}x^2-\frac{1}{4}x+\frac{3}{16}=0$$