

High School Department

162D EXAMINATION

ADVANCED ALGEBRA

Tuesday, January 23, 1900—9.15 a. m. to 12.15 p. m., only

Answer to 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 Prove that a quadratic surd can not equal the sum of a rational quantity and a quadratic surd. Extract the square root of $20 - 5\sqrt{12}$

2 Simplify $\frac{\sqrt{-x} + \sqrt{-y}}{\sqrt{-x} - \sqrt{-y}}, \frac{a + \sqrt{-x^2}}{a - \sqrt{-x^2}} - \frac{a - \sqrt{-x^2}}{a + \sqrt{-x^2}}$

3 Extract the cube root of

$$a^{\frac{3}{2}} - 9a^{\frac{1}{2}} + 33a^{\frac{3}{2}} - 63a + 66a^{\frac{1}{2}} - 36a^{\frac{3}{2}} + 8a^{\frac{3}{2}}$$

4 Solve $\sqrt[3]{\frac{1}{x^3}} + \frac{1}{x^{\frac{1}{2}}} = \frac{3 - \sqrt[3]{x^2}}{x}$

5 Solve $\sqrt{x+3} + \sqrt[3]{x+3} = 6$

6 A crew rows down stream and back, a total distance of 40 miles, in 7 hours; had the rate of rowing up stream been 2 miles an hour less, the return trip would have taken 10 hours. Find the rate of *a*) the crew in still water, *b*) the stream.

7 Prove that if four quantities are in proportion they will be in proportion by *a*) composition, *b*) alternation.

8 In a school of 25 boys and 18 girls how many classes could be formed each to consist of 5 boys and 3 girls?

9 Derive the formula for *a*) the last term of a geometric progression, *b*) the sum of the terms of an arithmetic progression.

10 Find by the binomial theorem the value of $\sqrt[5]{34}$ to four decimal places.

11 Resolve into partial fractions $\frac{2x^2 + x - 1}{2x^2 + x - 3}$

12 Expand $\sqrt{1+x-x^2}$ to four terms by the method of undetermined coefficients.

13 Given $\log 2 = .3010$, $\log 3 = .4771$, $\log 7 = .8451$; find $\log \sqrt[7]{\frac{30}{21}}$.

Solve $15^x = 168$

14 Find the sum of the series $1 + 2x + 7x^2 + 23x^3 + 76x^4 + \dots$

15 Transform $x^4 - 8x^3 - 5x + 1 = 0$ into an equation whose second term is wanting.