High School Department

157TH EXAMINATION

ADVANCED ALGEBRA

Tuesday, January 24, 1899—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 *mean proportional, imaginary quantity, mixed surd, mantissa, convergent.*

2 Extract the square root of $75 - 12\sqrt{21}$

3 Simplify $\left((a^{-\frac{1}{2}}\sqrt[3]{x})^{-3}\right)\left(\sqrt{x^{-3}\sqrt{a^{-2}}}\right)$, $(x^a y^{-b})^3\ (x^3 \cdot y^2)^{-a}$, $(\sqrt[3]{ab^{-1}c^{-2}})\ (a^{-1}b^{-3}c^{-4})^{-\frac{1}{3}}$

4 Solve $ax^2 + bx + c = 0$ and show when the roots will be (*a*) real and equal, (*b*) real and unequal, (*c*) imaginary.

5 Prove that if two variables are constantly equal and each approaches a limit their limits are equal.

6 Prove that if four quantities are in proportion they will be in proportion by (*a*) division, (*b*) inversion.

7 At simple interest $400 amounted to $480 in a certain time and at a certain rate; if the time had been 1 year less and the rate 2 per cent more, the amount would have been $484. Find the time and rate.

8 A agrees to pay a debt of $3600 in 40 payments which form an arithmetic progression; after 30 payments are made one third of the debt remains unpaid. Find the first payment.

9 Write the first *five* terms of the expansion of $\left(\sqrt{a^2} - \frac{b^{\frac{1}{2}}}{6a^{-2}}\right)^8$ by the binomial theorem.

10 Change $\frac{355}{113}$ into a continued fraction and find the fifth convergent.

11 Expand $\frac{1-x}{1+x+x^2}$ to *five* terms by the method of undetermined coefficients.

12 Resolve $\frac{x+2}{6x^2+13x+6}$ into partial fractions.

13 Find the sum of the series $1+3x+4x^2+7x^3+11x^4+\ldots$

14 Given $\log 2 = .3010$, $\log 3 = .4771$, $\log 7 = .8451$; find $\log .0125$, $\log 4\frac{2}{3}$, $\log \sqrt[8]{\frac{3^5 5^4}{\sqrt{2}}}$

15 One root of the equation $6x^4 - 13x^3 - 35x^2 - x + 3 = 0$ is $2 - \sqrt{3}$; find the other roots.