Examination Department

139TH EXAMINATION

ADVANCED ALGEBRA

August 1896 — Three hours, only

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100 credits, necessary to pass, 75

Answer 10 questions but no more. If more than 10 questions are answered only the first 10 of these answers will be considered. Division of groups is not allowed. 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.

1 Define *imaginary quantity, arithmetic progression, convergent series, continued fraction, logarithm.*

2 Find the square root of $9 - 4\sqrt{5}$

3 Reduce $\dfrac{1}{a^{\frac{1}{2}} - b^{\frac{2}{3}}}$ to an equivalent expression with a rational denominator.

4 If both members of an inequality be multiplied or divided by the same negative quantity how is the inequality affected? Give proof. Illustrate by numeric example.

5 Transform $\frac{1549}{1189}$ into a continued fraction and find the value of the fourth convergent.

6 Derive the formula for the number of permutations of n things taken r at a time.

7 Derive the formula for the sum of the terms in arithmetic progression.

8 If the sum of three numbers in geometric progression is 65 and their product is 3375 what are the numbers?

9-10 Prove the theorem of undetermined coefficients and apply it to separate into partial fractions $\dfrac{x-7}{x^2+x-2}$

11 In the system whose base is 3 what is the logarithm of $\frac{1}{3}$? of $\frac{1}{9}$? of 27? of 81? of $\frac{1}{243}$? Prove that in the common system of logarithms the mantissa is always the same for the same sequence of figures.

12-13 Prove that an equation of the nth degree can not have more than n roots, and find all the roots of $x^4 - 10x^3 + 35x^2 - 50x + 24 = 0$

14-15 Give Descartes' rule of signs and apply it to determine the nature of the roots in the equation $x^4 - 21x^2 - 100 = 0$