Mathematics 3010 Final Exam **Name:** _____

1. (3 pts) Who invented logarithms, and to what did he apply them?

2. (4 pts) What is a fluxion?

3. (3 pts) List three of Archimedes inventions.

4. (10 pts) Write a short essay on the history of Calculus from Descartes and Fermat to Newton and Leibniz. Include as much concrete information as possible.

5. (10 pts) Choose a topic: a) Rigor in Calculus or b) Apollonius' conic sections and write a short summary.

6. (10 pts) Give either a) a short history of the solution of the cubic equation, or b) a short history of the reform of astronomy begun in the 16th century.

7. (12 pts) Write the discoverer/inventor for the following symbols.

+	
=	
dx	
f’	
letters as variables	
decimal fractions with decimal point	

8. (10 pts) Find the first four terms of the power series expansion of $(1+x)^{2/3}$ using Newton’s method.

9. (8 pts) Find $d(x^y)$ using Leibniz’ techniques (hint: first take a logarithm and use the fact that d(log z) = dz/z.

10. (8 pts) Use Fermat's technique of "adequality" (either one) to find the locations of the potential maximum and minimum values of the function x^3-*ax.*

11. (8 pts) Find the length of the subnormal *v* to the curve $y = x^{3/2}$ at $x = 2$.

12. (8 pts) Give a short account of a) the brachistochrone problem and its solution or b) Diophantus' work and notation.

13. (6 pts) Give short definitions/explanations of the following astronomical concepts:

a. celestial equator

b. ecliptic

c. declension

Bonus problem: Give an example of an infinitely differentiable function with no Taylor series (or more precisely, a Taylor series that converges only at a single point) and explain it.