

# Essay Assignment

Below, I give some suggestions for areas to pursue, but these should not be interpreted in a limiting manner. If you wish to try something else, please approach me with your proposal. The essay should run over four pages long, and be typed or word-processed, with good grammar, and it should express something mathematical, and, in particular, something about calculus.

## *Historical Essay*

This would be a paper that (a) profiles the life of a contributor to mathematical heritage (specifically, calculus), (b) describes some of their mathematical achievements, and (c) relates their achievements to the intellectual and cultural world of their time.

## *Applied Essay*

This paper could present how the calculus we study relates to other areas in which mathematics, and calculus in particular, are applied : economics, biology, physiology, physics, chemistry, . . . . It could be more specific than this, relating to a particular part of the area in question, say marginal rates of return, or heat diffusion through a porous medium, or . . . .

## *Calculus Essay*

You could pick a family of curves and describe in detail how the shape of the curve varies as the parameters vary. You should choose a family to analyze, and it should not be something covered extensively in precalculus, eg parabolas and trigonometric functions. Some suggestions are (a,b,k, $\alpha$ , $\beta$  are positive real numbers) :

$$\begin{array}{ll} x^a + x^{-b} & \text{(if adventurous, try } \alpha x^a + \beta x^{-b} \text{ )} \\ a/(1 + be^{-kx}) & \\ x^a + y^a = 1 & \text{(implicit function)} \end{array}$$

Or you could pick a family of equations and examine how the solutions to these equations vary as the parameter varies. One important tool in solving equations is Newton's Method. Some sample equations would be :

$$\begin{array}{lll} ax & = & \cos(x) \\ ax & = & e^x \end{array}$$

and others.