Calculus Lab 3

4 October 2006

For this lab, please work in pairs.

Goals:

- Gain more experience using Maple to plot functions.
- Gain a deeper understanding of the derivative.

1. Adding Sine Waves:

   (a) Write down the equation for a sine wave with a period of 1. Plot this function. Call this function $f(t)$.

   (b) Write down the equation for a sine wave with a period of 1.01. Plot this function. Call this function $g(t)$.

   (c) Plot $f(t) + g(t)$—the two sine waves added together. Look at the resulting plot on different scales. What do you notice? Why does the graph have the shape that it does?

2. Tangent lines and slopes.

   (a) Consider the function $f(x) = \frac{1}{x^2}$. Numerically determine $f'(1)$. Do this by using Maple or a calculator to evaluate the limit.

   (b) Plot $f(x)$. (Choose limits carefully.) Does your value for $f\prime(1)$ make sense given the appearance of the graph?

   (c) Determine the equation of the line tangent to $f(x)$ at $x = 1$.

   (d) Plot $f(x)$ and the tangent line together on the same axes. Does it look like you'd expect it to?

   (e) Zoom in on the plot near $x = 1$. Does it look like you'd expect it to?