

**Lab 1: Review**

Instructions: Use Maple to help answer the following final exam from a Calculus I class.

1. Find the equation of the tangent line to  $f(x) = x^2 - 2x - 3$  at the point  $(-2, 5)$ .

2. Find  $dy/dx$  for  $x^3 - 2x^2y = 38$ .

3. Evaluate:

$$\int \frac{7 + 3x^{3/2}}{x} dx$$

4. The number of bacteria in a certain colony after  $x$  days is given approximately by:

$$y = 3,000,000 \left[ 1 - \frac{1}{\sqrt[3]{(x^2 - 1)^2}} \right]$$

Find the rate of change of the size of the colony.

5. Consider the function:

$$f(x) = \begin{cases} \frac{1 - \sqrt{4x^2 - 3}}{x - 1} & x \neq 1 \\ -2 & x = 1 \end{cases}$$

Is this function continuous?

6. Evaluate:

$$\int_0^1 \frac{1}{4 + x^2} dx$$

7. Determine whether the Mean Value Theorem can be applied to  $f(x) = \frac{1}{x^2-6}$  on  $[2, 3]$ . If it cannot, state why. If it can, find all values  $c$  such that:

$$f'(c) = \frac{f(3) - f(2)}{3 - 2}$$

8. Using our methods from class, determine what a sketch of the graph of  $f(x) = \frac{x}{1-x}$  would look like. Use Maple to plot the function, then sketch it on the bottom of this page, and show how it agrees with your work.