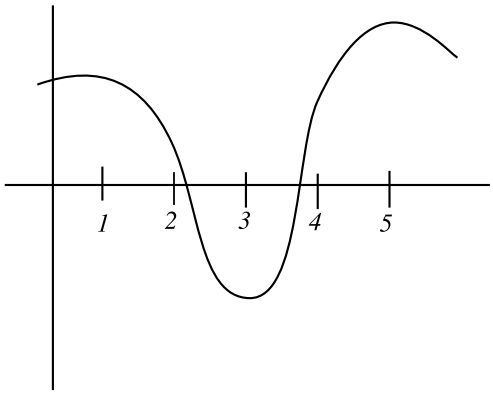
Name: Midterm 2 Practice Exam

You have 50 minutes to complete this practice exam. Show all work. If you finish early, you may turn in your exam and work on your own until the 50 minutes are up. Then, I will choose one person to present each problem on the board, focusing not only on solving the problems but on writing clear work and explanations.

1. The graph of a function $f(x)$ is shown below.



   (a) List the intervals of increase and decrease for $f(x)$.

   (b) List the intervals where $f(x)$ is concave up and concave down.

   (c) List the x coordinates of any critical points. Are they maxima or minima?

2. Let $f(x) = x^3+2x+1$. Find $(f^{-1})'(4)$ (the derivative of the inverse function of $f(x)$ evaluated at the point 4). Hint: do not try to find f^{-1} in general.

3. Compute derivatives of the following functions. Do not simplify your answer.

   (a) $h(t) = 4^t \log_4 t$

   (b) $g(x) = \arcsin(\ln x)$

   (c) $j(x) = x^{sin(x)}$

4. A crate with square base and a volume of 15 cubic meters is needed. The material for the bottom costs \$2 per square meter, material for the top costs \$3 per square meter, and material for the sides costs \$1 per square meter. Find the dimensions of the crate that minimize the cost of the materials. What is the minimum material cost?

5. Let $f(x) = \sqrt{x}$

   (a) Find the linearization of $f(x)$ at $x = 9$.

   (b) Use the linearization to approximate $\sqrt{10}$.

6. Consider the equation $xy^2 + 2x^2 = y$.

   (a) Check that the point (-1,1) is on the graph of the equation.

   (b) Use implicit differentiation to find the slope of the tangent line to the graph of the equation at the point (-1,1).