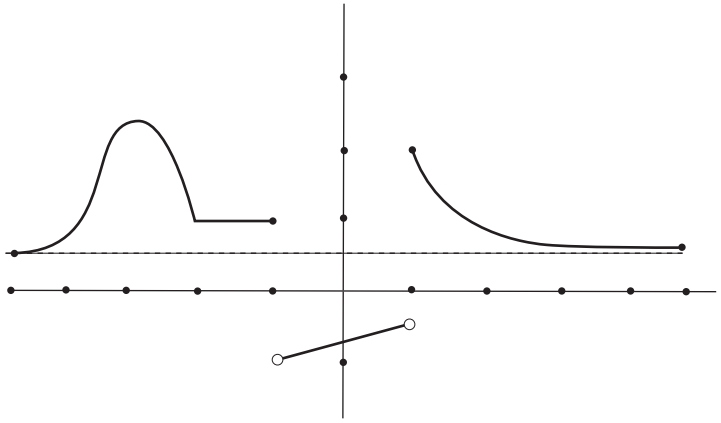
Math 29
Practice problems for Exam 3

(1) The cost of producing x widgets at a new factory is $C(x)$ dollars.
   (a) What is the meaning of $C'(x)$?
   (b) What are the units of $C'(x)$?
   (c) What does the statement $C'(800) = 17$ mean?
   (d) Do you think the values of $C'(x)$ will increase or decrease in the short term? What about in the long term?

(2) For the following graph, make a table of what you know about $f'(x)$, and use your table to draw a graph of $f'(x)$.



(3) Use the basic rules of differentiation to find the derivative of the function $f(x) = (\sqrt{2})x + \sqrt{4x}$.

(4) Find the derivative of the function

$$f(x) = \sqrt{x + \sqrt{3x^2 + \sqrt{e^{5x+1}}}}$$

(5) Sketch a graph of a function $f(x)$ that satisfies all of the following conditions:
   (a) $f'(x) > 0$ for $x < 1$.
   (b) $f'(x) < 0$ for $x > 1$.
   (c) $f''(x) > 0$ for $x < -2$ and $x > 2$.
   (d) $f''(x) < 0$ for $-2 < x < 2$.
   (e) $\lim_{x\to-\infty} f(x) = -2$ and $\lim_{x\to\infty} f(x) = 0$

(6) For the function $f(x) = \ln(x^4 + 4)$ find the intervals of increase and decrease, the local maxima and local minima, the intervals of concavity, and the inflection points. Then sketch the graph.

(7) Find two nonnegative numbers whose sum is 10 and whose product is as large as possible.