AP Calculus BC
Lesson 3.2 Openers

1. a)   In the standard window, graph the functions $f(x) = |x|$ and $h(x) = x^2$.
    What do you think are the values of $f'(0)$ and $h'(0)$.

    b)   Turn the axes off on your graph, and zoom in on the origin.
    What are the values of $f'(0)$ and $h'(0)$?

    c)   The TI-89 has two different derivative features. Use $d($ and nDeriv(to calculate $f'(0)$.
    The syntax is: $d(abs(x),x)|x=0$ and $nDeriv(abs(x),x)|x = 0$.
    What does this tell you about your calculator?

2.   Sketch the graph of a function f(x) consistent with the following information.

x	-2	0	1	4
$f(x)$	1	-3	-1	1
$f'(x)$	-3	1	0	2

3.   The graph of $f'(x)$ is given below.

    a)   What is $f'(2)$? $f'(-1)$? $f'(5)$?

    b)   If f(2) = 3, write an equation for the tangent line to the graph of $f(x)$ at the
    point where $x = 2$.

    c)   Could $y = -x + 3$ be the line tangent to the curve $y = f(x)$ where $x = 6$?
    Why or why not?

    d)   Could f(0) = f(1) ?

    e)   Which is larger, f(0) or f(4)? Why?
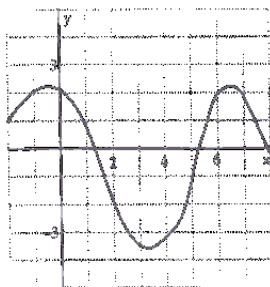
4. Given $f'(x) = \dfrac{1}{x}$ and f(2) = 5, write an equation for the line which is tangent to the graph

of f(x) at the point where x = 2.

5. Given at right is a graph of f(x).

If $f'(x)$ is a function which gives the slope of

the graph of f(x) at the point (x, f(x)),

find $f'(2)$ and $f'(0)$

Graph of f
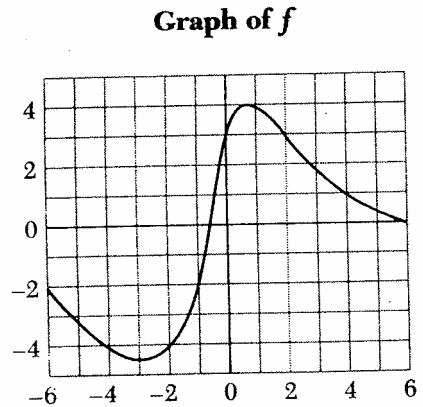
6. Given f(2) = 4 and $f'(x) = -1$ for $0 \le x \le 4$

a) Find f(3)

b) Find f(0)

c) Find a rule for f(x) on [0, 4]

7. Suppose that f(0) = 2 and $-3 \le f'(x) \le 4$ for all x.

a) Find an upper and a lower bound for f(2)

b) Find an upper bound for f(-5)

c) Suppose that g(0) = 2 and $g'(x) \ge 4$ for all x. Which is larger: f(2) or g(2)?

d) Using g from part c), compare f(-5) and g(-5).

8. Let f(x) be the elevation in feet of the Mississippi River x miles from its source. What are the units of $f'(x)$? What can you say about the sign of $f'(x)$? (Assume that $0 \le x \le$ length of the river.)

9. Let g(t) be the height, in inches, of Amelia Earhart t years after her birth. What are the units of $g'(x)$?

    What can you say about the signs of $g'(10)$ and $g'(30)$?
    (Assume that $0 \le t < 39$, the age at which Amelia Earhart's plane disappeared.)

10. An economist is interested in how the price of a certain commodity affects its sales. Suppose that at a price of $p, a quantity, q, of the commodity is sold. If $q = f(p)$, explain in economic terms the meaning of the statements $f(10) = 240,000$ and $f'(10) = -29,000$.

11. The temperature T, in degrees Fahrenheit, of a cold yam placed in a hot oven is given by T= f(t), where t is the time in minutes since the yam was put in the oven.

    a) What is the sign of $f'(t)$? Why?
    b) What are the units of $f'(t)$?
        What is the practical meaning of the statement $f'(20) = 2$?