CHECK YOUR UNDERSTANDING.

EXAMPLE 1: Compute the derivative, $f'(x)$, then find $f'(1)$ for the following functions:

a) $f(x) = x^2 + 3$
b) $f(x) = 7\sqrt{x} + \frac{5}{x^3}$
c) $f(x) = 3x^5 + 2x^2 + \frac{1}{x}$

EXAMPLE 2: Find when $f'(x) = 0$ for the function $f(x) = 3x^2 + 12x + 4$

EXAMPLE 3: Suppose that the Revenue of a company can be modelled by $R(q) = -q^2 + 400q + 22500$. Find the rate of change of Revenue when $q = 100$.

EXAMPLE 4: Suppose the height of a ball, in feet, can be modeled by:

$$s(t) = 16 - (t - 4)^2$$

where time, t ,is measured in seconds. Find the instantaneous velocity at $t = 2$

EXAMPLE 5: If $h(x) = \frac{4abx+c}{d}$ where $a, b, c, \& d$ are constants. Find $h'(x)$:

EXAMPLE 6: An elastic band is hung on a hook and a mass is hung on the lower end of the band. When the mass is pulled downward and then released, it vibrates vertically. The equation of motion is

$$s(t) = 2\cos(t) + 3\sin(t), \quad t \geq 0$$

where $s(t)$ is measured in centimeters and time t in seconds. (We take the positive direction to be downward.)

a) Find the velocity at time t. Be sure to include units.
b) Graph the velocity and position functions.

EXAMPLE 7: For the function $f(x) = -x^3 + 3x^2 - 4$

a) Find the intervals where the function is increasing, decreasing.
b) Find the inflection points.
c) Find the intervals where the function is concave up, concave down.
d) Sketch the graph