Calculus 120

Check Your Understanding (Lessons 1 - 4)

1. Find the third derivative of $f(x) = 5x^4 + \sqrt{x}$. Do **NOT** simplify.

2. The position function of a particle is $s(t) = 2t^3 - 15t^2 + 48t - 10,\ t \geq 0,$ where *t* is measured in seconds and *s* in meters. Determine the particle's acceleration when its velocity is 12 m/s.

3. Use implicit differentiation to find y'.

$$3x^8 - 5x^2y^4 = 2x + \frac{1}{3}y^6$$

4. Use implicit differentiation to find the second derivative, y''. *Write your final answer in terms of x and y.*

$$x^4 + 7 = y^2$$

5. The position of a particle moving along a straight line is given by the function given below.

$$s(t) = 2t^3 - 7t^2 + 4t + 1,\ \ t \geq 0$$

When is the particle moving in the positive direction and the negative direction? *Justify your answer using a number line.*

6. Two cars leave an intersection at the same time, one travelling south at 35 mph, and the other travelling east at 42 mph. At what rate is the distance between them changing 30 minutes later?

7. Water is flowing at the rate of 50 m^3/min from a concrete conical reservoir (vertex down). If the height of the tank is 6 m and its diameter is 90 m, at what rate is the water level changing when the water is 5 m deep?