Math 151
Quiz 4
Fall 2008

Show all work in a neat and organized fashion. Clearly indicate your answers.
20 points possible.

1. (5 pts.) Find dy/dx by implicit differentiation.

$$2x^3 + x^2y - y^3 = 11$$

2. (5 pts.) A particle moves in a straight line according to a law of motion

$$s = f(t) = t^3 - 15t^2 + 27t + 10,$$

$t \geq 0$, where t is measured in seconds and s in feet.

(a) Find the velocity at time t.

(b) What is the velocity after 3 seconds?

(c) When is the particle at rest?

(d) Find the acceleration at time t.

(e) When is the particle speeding up?

3. (5 pts.) If $x^2 + y^2 = 100$ and $dy/dt = 15$, find dx/dt when $y = 8$. (Assume x and y are always positive.)

4. (5 pts.) A trough is 12 ft long and its ends have the shape of isosceles triangles that are 1 ft across at the top and have a height of 4 ft. If the trough is being filled with water at a rate of $15\,\text{ft}^3/\text{min}$, how fast is the water level rising when the water is 3 ft deep?