Name: _____

1. Using the chain rule, compute the following derivatives.

   (a) $\dfrac{d}{dx}\left(\sec^2(\pi x)\right)$

   (b) $\dfrac{d}{dx}\left(\cot\left(\dfrac{\sin(x)}{x}\right)\right)$

   (c) $\dfrac{d}{dx}\left(4 - 3x^2\right)^9$

   (d) $\dfrac{d}{dx}\left(x\tan(x)\right)^8$

2. Using implicit differentiation, find dy/dx.

   (a) $2xy + y^2 = x + y$

   (b) $xy = \cos(xy)$

   (c) $e^{x^2y} = 2x + 2y$

3. The following problems are from section 3.10. (Related rates) The textbook offers a useful problem solving strategy on page 195. Alternatively, you can use the following strategy:

   - **Step 1**. Draw a picture to identify important information, like variables and constants.
   - **Step 2**. *Write down* what you are trying to find.
   - **Step 3**. Identify an equation that relates your variables.
   - **Step 4**. Differentiate, then evaluate to find your solution.

   (a) Assume that the radius r and area A of a circle are differentiable functions of the variable t. Write an equation that relates dA/dt to dr/dt.

(b) A hot air balloon is rising vertically into the air above a straight road at a constant rate of 1 ft/sec. When the balloon is 65ft above the ground, a cat moving at a constant rate of 17ft/sec passes under it. How fast is the distance $s(t)$ between the cat and balloon increasing 3 seconds later?

(c) Two people are at an elevator. At the same time, one person begins to walk away from the elevator at a rate of 1ft/sec, and the other person starts going up in the elevator at a rate of 4ft/sec. At what rate is the distance between the two people changing 10 seconds later?