Math 261 – Summer Lab 9 **Implicit Differentiation** Name_____

Show all work for credit. Also, give exact answers unless otherwise noted.

1. Assume that each equation determines a differentiable function *f* such that *y=f(x)*, find *f'(x)*.

   (a) $y^2 + x^2 = 2x + 3y^2$ (b) $2xy = x^2 - \sqrt{y}$

2. Assume that each equation determines a differentiable function *f* such that $y = f(x)$, find $f'(x)$.

   (a) $x\sin y + y\sin x = 1$ (b) $x^2(x-y)^2 = x^2 - y^2$

3. Find an equation of the tangent line to the graph of $(x^2 + y^2)^2 = 50xy$ at the point (2, 4).

4. Assume $t^2v^3 = 1$ determines a function $v = f(t)$, use implicit differentiation to show that $v'' = \frac{10}{9}v^4$.

5. Assume that a rectangle has side lengths a and b.

   a. Find a formula for the area A of the rectangle in terms of a and b.

   b. Assume that a and b are changing over a period of time, and that $a(t) = t^2 + t$ and $b(t) = t^3 - t$ after t seconds. Find a function $A(t)$ that gives the area of the rectangle at time t.

   c. Use the formula from part b to find $\frac{dA}{dt}$.

   d. Now, use implicit differentiation on your formula from part a to find $\frac{dA}{dt}$. Compare your answer with what you found in part c.