Math 125.01 Name:_____
Lab 6 - Sections 3.3 & 3.5
March 4, 2008

1. Suppose that $h(x) = f(x)g(x)$ and $F(x) = f(g(x))$, with $f(2) = 3$, $f(5) = -7$, $f'(2) = -2$, $f'(5) = 11$, $g(2) = 5$, $g(3) = -4$, $g'(2) = 2$, and $g'(3) = 5$. Find $h'(2)$ and $F'(2)$.

2. Does $\frac{d}{dx}\cos^2 x = \frac{d}{dx}\cos x^2$? Justify your answer.

3. Differentiate the following functions.

   (a) $f(x) = (x^2 + 4x - 5)^4$

   (b) $g(x) = 4\cos 3x - 3\sin 4x$

   (c) $h(x) = \cos(3x^2 + 1)$

   (d) $p(y) = (y + 3)^3(5y + 1)^2(3y^2 - 4)$

   (e) $f(t) = \left(\dfrac{2t^2 + 1}{3t^3 + 1}\right)^2$

   (f) $f(x) = \sin^2(\cos 3x)$

   (g) $z(x) = (1 + (1 + (1 + (1 + \sin x)^2)^3)^4)^5$

   (h) $y = x^2e^{-x}$

   (i) $f(x) = xe^x - e^x$

   (j) $g(x) = \dfrac{\sqrt{x}}{\sin 2x + e^{5x}}$

   (k) $h(x) = e^{3x}(\sin 5x + \cos 2x)$

4. Find an expression for $\dfrac{dy}{dx}$ for each of the following curves.

   (a) $4x^2 - 9y^2 = 36$

   (b) $x^{2/3} + y^{2/3} = 1$

   (c) $y = \cos(x - y)$

   (d) $x\sin y + y\cos x = 1$

5. Find the equations of both of the tangent lines to the ellipse $x^2 + 4y^2 = 36$ that pass through the point $(12, 3)$.