Math 261 - Summer Lab 8 **Differentiation Practice** Name: _____

1. Find the deriviative of each of the following functions. Simplify your answers completely.

(a) $f(x) = x^2 + 1$

(b) $f(x) = \sqrt{x^2 + 1}$

(c) $f(x) = \sin\left(\sqrt{x^2 + 1}\right)$

(d) $f(x) = \dfrac{x^2 + 1}{\sec\left(3x + \frac{\pi}{2}\right)}$

(e) $f(x) = \tan(x)$

(f) $f(x) = \tan(x^3)$

(g) $f(x) = \tan^3(x)$

(h) $f(x) = \tan^3(x^3)$

(i) $f(x) = 3\sec\left(\dfrac{5x}{3}\right)$

(j) $f(x) = \pi^3 \csc(\pi x^2)$

(k) $f(x) = \left(3x^2 + \dfrac{3}{x^2}\right)\cos(3x)$

(l) $f(x) = \dfrac{\cos 3x}{\cot x}$

(m) $f(x) = 3\cos(\cot x)$

(n) $f(x) = \dfrac{2x\cos(x^2)}{\sin 3x}$

(o) $f(x) = \dfrac{5x^3 - 6x + 7}{2x^2}$

(p) $f(x) = \dfrac{x^2 + 3}{(2x-1)^3} + \dfrac{7x - 2}{(2x-1)^2}$

2. Find the following higher order derivatives. Simplify your answers completely.

(a) Find $f''(x)$ if $f(x) = (x^3 - 1)^3$

(b) Find $f''(x)$ if $f(x) = \cos(3x)\cot(x)$

(c) Find $f''(x)$ if $f(x) = \cos^3 2x$

(d) Find $f'''(x)$ if $f(x) = \dfrac{4x-3}{x+1}$

(e) Find $f^{(5)}(x)$ if $f(x) = \sin 2x$