Calculus I, Fall 2014
Quiz 4 Name: ______________________

You must show all your work to receive credit. Calculators are allowed.

Problem 1: (5 points) Find the following derivatives:

a) $(3x^2 - 2x + 5)'$ $= 6x - 2$

b) $\frac{d}{dt}(2^2 + \sqrt{3t})$ $= \frac{d}{dt}\left(4 + \sqrt{3}\, t^{1/2}\right) = \frac{\sqrt{3}}{2} t^{-1/2}$

c) $\frac{d}{dx}[(x+2)^2]$ $= \frac{d}{dx}\left[x^2 + 4x + 4\right] = 2x + 4$

d) $\left(\frac{2x+1}{x-2}\right)'$ $= \frac{(2x+1)'(x-2) - (2x+1)(x-2)'}{(x-2)^2} = \frac{2(x-2) - (2x+1)(1)}{(x-2)^2} = -\frac{5}{(x-2)^2}$

e) $[(x^2+2x)(x^{-2} + \pi x^{1/3})]'$ $= (x^2+2x)'(x^{-2} + \pi x^{1/3}) + (x^2+2x)(x^{-2} + \pi x^{1/3})'$

$= (2x+2)(x^{-2} + \pi x^{1/3}) + (x^2 + 2x)(-2x^{-3} + \frac{\pi}{3} x^{-2/3})$

$= \frac{7}{3}\pi x^{4/3} - 2x^{-2} + \frac{8}{3}\pi x^{1/3}$

Problem 2: (5 points) Use the limit definition of a derivative and properties of limits to prove that $[f(x) + g(x)]' = f'(x) + g'(x)$.

$$[f(x) + g(x)]' = \lim_{h \to 0} \frac{f(x+h) + g(x+h) - f(x) - g(x)}{h}$$

$$= \lim_{h \to 0} \left[\frac{f(x+h) - f(x)}{h} + \frac{g(x+h) - g(x)}{h}\right] = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h} + \lim_{h \to 0} \frac{g(x+h) - g(x)}{h}$$

$$= f'(x) + g'(x)$$