Math 132 Quiz 2 Date 10/08/2010

Ex 1: Use the definition of the derivative to find:

a) $f'(x)$ if $f(x) = x^2 + 4x - 8$

b) $g'(x)$ if $g(x) = \frac{6}{x}$

Ex 2 Find an equation of the tangent line to the curve $f(x) = -9x^{1/3} + 5x^{-2/5}$ at $x_0 = 1$

Solution

Ex 1: a) $\lim_{h\to 0} \frac{f(x+h)-f(x)}{h} = \lim_{h\to 0} \frac{x^2+2xh+h^2+4x+4h-8-x^2-4x+8}{h}$

$= \lim_{h\to 0} \frac{2xh+h^2+4h}{h} = \lim_{h\to 0} 2x+4+h = 2x+4$

Hence $f'(x) = 2x+4$

b) $\lim_{h\to 0} \frac{g(x+h)-g(x)}{h} = \lim_{h\to 0} \frac{\frac{6}{x+h} - \frac{6}{x}}{h} = \lim_{h\to 0} \frac{\frac{6x-6x-6h}{x(x+h)}}{h}$

$= \lim_{h\to 0} -\frac{6}{x(x+h)} = -\frac{6}{x^2}$. Hence $g'(x) = -\frac{6}{x^2}$

Ex 2

$$f'(x) = -9.\frac{1}{3}.x^{1/3-1} + 5.\left(-\frac{2}{5}\right)x^{-2/5-1} = -3x^{-\frac{2}{3}} - 2x^{-\frac{7}{5}}$$

Therefore the slope of the tangent line is $f'(1) = -5$.
An equation of the tangent line is then:

$$y = -5(x-1)\underbrace{-4}_{f(1)=-4} = 1-5x$$