MTH 132.12 Quiz 4
Friday 18 February 2011

Name:

Show *all* your work. Points will be deducted for incomplete work. No calculators are allowed.

1. Compute the following derivatives. Show each derivative rule or formula you use.

   (a) $\frac{d}{dx}\sin(x^2+2x)$

   $$\frac{d}{dx}\sin(x^2+2x) = \cos(x^2+2x)\frac{d}{dx}(x^2+2x) = (2x+2)\cos(x^2+2x)$$

   (b) $\frac{d}{dx}\left[\frac{(6x-9)(4x+6)}{8x^2-18}\right]$

   $$\frac{d}{dx}\left[\frac{(6x-9)(4x+6)}{8x^2-18}\right] = \frac{d}{dx}\left[\frac{3(2x-3)2(2x+3)}{2(4x^2-9)}\right] = \frac{d}{dx}\left[\frac{6(4x^2-9)}{2(4x^2-9)}\right] = \frac{d}{dx}[3] = 0$$

   Alternatively,

   $$\begin{aligned}\frac{d}{dx}\left[\frac{(6x-9)(4x+6)}{8x^2-18}\right] &= \frac{d}{dx}\left[\frac{24x^2-54}{8x^2-18}\right]\\ &= \frac{(8x^2-18)\frac{d}{dx}[24x^2-54]-(24x^2-54)\frac{d}{dx}[8x^2-18]}{(8x^2-18)^2}\\ &= \frac{(8x^2-18)48x-(24x^2-54)16x}{(8x^2-18)^2}\\ &= \frac{384x^3-864x-(384x^3-864x)}{(8x^2-18)^2}\\ &= \frac{0}{(8x^2-18)^2} = 0\end{aligned}$$

2. Suppose f and g are differentiable functions with the following values:

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
0	1	4	1	$\frac{1}{5}$
1	3	2	0	$\frac{1}{3}$

   Compute the following derviatives. Show each step.

   (a) $\frac{d}{dx}|_{x=0}[f(g(x))]$

   $$\frac{d}{dx}|_{x=0}[f(g(x))] = f'(g(0))g'(0) = f'(1)g'(0) = 2\cdot\frac{1}{5} = \frac{2}{5}$$

   (b) $\frac{d}{dx}|_{x=1}\left[\frac{f(x)}{g(x)+1}\right]$

   $$\begin{aligned}\frac{d}{dx}|_{x=1}\left[\frac{f(x)}{g(x)+1}\right] &= \frac{(g(1)+1)f'(1)-f(1)\frac{d}{dx}|_{x=1}(g(x)+1)}{(g(1)+1)^2}\\ &= \frac{(g(1)+1)f'(1)-f(1)g'(1)}{(g(1)+1)^2}\\ &= \frac{(0+1)\cdot 2-3\cdot\frac{1}{3}}{(0+1)^2} = 1\end{aligned}$$