Solution to Quiz 2

MATH 1231 – Single-variable Calculus I

Summer 2016

1. Find the **slope** of the tangent line at the point $(\frac{\pi}{2}, 0)$ to the graph of the following equation

$$y^2 + cos(x + y) = xy$$

(4 points)

Solution: Differentiating both sides with respect to x,

$$\begin{aligned} 2yy' - sin(x + y)(1 + y') =& xy' + y \\ 2yy' - sin(x + y) - sin(x + y)y' =& xy' + y \\ 2yy' - sin(x + y)y' - xy' =& y + sin(x + y) \\ y'(2y - sin(x + y) - x) =& y + sin(x + y) \\ y' =& \frac{y + sin(x + y)}{2y - sin(x + y) - x} \end{aligned}$$

Substituting $x = \frac{\pi}{2}, y = 0$, we have,

$$y' = \frac{0 + sin(\frac{\pi}{2})}{2.0 - sin(\frac{\pi}{2}) - \frac{\pi}{2}} = \frac{1}{-1 - \frac{\pi}{2}}$$

2. Differentiate the functions (no need to simplify) **(6 points)**

(a)

$$f(\theta) = sin(\theta)cos(sin(\theta))$$

Solution:

$$\begin{aligned} f'(\theta) =& \frac{d}{d\theta}(sin\theta)cos(sin\theta) + sin\theta\frac{d}{d\theta}(cos(sin\theta)) \\ =& (cos\theta)cos(sin\theta) + sin\theta(-sin(sin\theta))cos\theta \\ =& cos\theta cos(sin\theta) - sin(sin\theta)sin\theta cos\theta \end{aligned}$$

(b)

$$g(x) = \frac{x\ sin(x)}{1 + cos(x)}$$

Solution:

$$\frac{(1 + cosx)(sinx + xcosx) - xsinx(0 - sinx)}{(1 + cosx)^2}$$