Homework 5

Name: **SOLUTIONS** Date: June 8, 2015

P 1. Find the derivative

$$xy^2 + \sin(x^2 + y) = y$$

Solution:

$$\frac{d}{dx}[xy^2 + \sin(x^2 + y)] = \frac{dy}{dx}$$

$$\frac{d}{dx}[xy^2] + \frac{d}{dx}[\sin(x^2 + y)] = \frac{dy}{dx}$$

$$\frac{d}{dx}[x] \cdot y^2 + \frac{d}{dx}[y^2] \cdot x + \frac{d}{dx}[\sin(x^2 + y)] = \frac{dy}{dx}$$

$$y^2 + 2y\frac{dy}{dx} \cdot x + \frac{d}{dx}[\sin(x^2 + y)] = \frac{dy}{dx}$$

$$y^2 + 2yx\frac{dy}{dx} + \cos(x^2 + y)\frac{d}{dx}[x^2 + y] = \frac{dy}{dx}$$

$$y^2 + 2yx\frac{dy}{dx} + \cos(x^2 + y)\left(2x + \frac{dy}{dx}\right) = \frac{dy}{dx}$$

$$y^2 + 2yx\frac{dy}{dx} + 2x\cos(x^2 + y) + \cos(x^2 + y)\frac{dy}{dx} = \frac{dy}{dx}$$

$$y^2 + 2x\cos(x^2 + y) = \frac{dy}{dx} - \cos(x^2 + y)\frac{dy}{dx} - 2yx\frac{dy}{dx}$$

$$y^2 + 2x\cos(x^2 + y) = (1 - \cos(x^2 + y) - 2yx)\frac{dy}{dx}$$

$$\frac{y^2 + 2x\cos(x^2 + y)}{1 - \cos(x^2 + y) - 2yx} = \frac{dy}{dx}$$

P 2. Find an equation for the tangent line to the graph of

$$x^2 \ln(xy) - 4x = 4y$$

at $x = 1$.

Solution: The equation has no y-coordinate for $x = 1$. Therefore there is no tangent line to the graph of the equation at $x = 1$.