Section 4.2

Part #2

Review: Find the derivative of $xy^2 + y = 16$

$\frac{d}{dx}\ xy^2 + \frac{d}{dx}y = \frac{d}{dx}16$

$x\ \frac{d}{dx}y^2 + y^2\frac{d}{dx}x + y' = 0$

$x\ 2y\cdot y' + y^2(1) + y' = 0$

$2xyy' + y' = -y^2$

$y'(2xy+1) = -y^2$

$y' = \frac{-y^2}{2xy+1}$

Find the derivative of $3x^2 = \cos(y)$

$\frac{d}{dx}\ 3x^2 = \frac{d}{dx}\cos y$

$6x = -\sin y \cdot y'$

$\frac{6x}{-\sin y} \quad \frac{-\sin y \cdot y'}{-\sin y}$

$y' = -\frac{6x}{\sin y}$

Find the derivative of $x^2y^2 + x\sin(y) = 4$

$\frac{d}{dx}\ x^2y^2 + \frac{d}{dx}\ x\sin y = \frac{d}{dx}\ 4$

$x^2(2yy') + y^2(2x) + x\cos y \cdot y' + \sin y(1) = 0$

$2x^2yy' + 2xy^2 + x\cos y \cdot y' + \sin y = 0$

$2x^2yy' + x\cos y \cdot y' = -2xy^2 - \sin y$

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

$y' = \frac{-2xy^2 - \sin y}{2x^2y + x\cos y}$ OR $= -\frac{2xy^2 + \sin y}{2x^2y + x\cos y}$

Find the equations of the tangent and normal lines for the equation below at the point $\left(\frac{\pi}{4}, \frac{\pi}{2}\right)$

$$x\sin 2y = y\cos 2x$$

$\frac{d}{dx}$ $\frac{d}{dx}$

$$x\frac{d}{dx}\sin 2y + \sin 2y\frac{d}{dx}x = y\frac{d}{dx}\cos 2x + \cos 2x\frac{d}{dx}y$$

$$x\cos 2y(2y') + \sin 2y(1) = y(-2\sin 2x) + \cos 2x\, y'$$

$$y' = \frac{-\sin 2y - 2y\sin 2x}{2x\cos 2y - \cos 2x}$$

$$m = \frac{-\sin 2\left(\frac{\pi}{2}\right) - 2\left(\frac{\pi}{2}\right)\sin 2\left(\frac{\pi}{4}\right)}{2\left(\frac{\pi}{4}\right)\cos 2\left(\frac{\pi}{2}\right) - \cos 2\frac{\pi}{4}}$$

$$= \frac{-\sin\pi - \pi\sin\pi/2}{\frac{\pi}{2}\cos\pi - \cos\pi/2}$$

$$= \frac{-0 - \pi(1)}{\frac{\pi}{2}(-1) - 0} = \frac{-\pi}{-\frac{\pi}{2}} = 2$$

Homework

p. 167 #5-8, 23, 25, 26

Typo the point should be $\left(1, \frac{\pi}{2}\right)$

Answers:

6. secy

8. $y' = \frac{1 - y}{x - \cos y}$

26. a. $y = \pi$

b. x = 0