

MATH 149 CALCULUS I

SOLUTIONS TO HOMEWORK 9

2.5.6. $x^2y + y^2x = -2$. find $\frac{dy}{dx}$

(take derivatives
of both sides
w.r.t. x)

$$2xy + x^2 \frac{dy}{dx} + 2y \frac{dy}{dx} \cdot x + y^2 = 0$$

Keep in mind
that y is a
function of x
so use product
rule!

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

$$\frac{dy}{dx} = \frac{-2xy - y^2}{x^2 + 2yx}$$

2.5.28. $x \cos y = 1$ find $\frac{dy}{dx}$ and evaluate at $(2, \frac{\pi}{3})$

$\frac{d}{dx}$

$$1 \cdot \cos y + x \cdot (-\sin y) \cdot \frac{dy}{dx} = 0$$

$$\frac{dy}{dx} = \frac{-\cos y}{-x \sin y} \Rightarrow \frac{dy}{dx} = \frac{\cos y}{x \sin y}$$

@ $(2, \frac{\pi}{3})$, $\frac{dy}{dx} = \frac{\cos(\frac{\pi}{3})}{2 \cdot \sin(\frac{\pi}{3})} = \frac{\frac{1}{2}}{2 \cdot \frac{\sqrt{3}}{2}} = \frac{1}{2\sqrt{3}}$

2.5.30. $(4-x)y^2 = x^3$ point $(2, 2)$

point $(-1, y^2) + (4-x) 2y \frac{dy}{dx} = 3x^2$

$$(4-x) 2y \frac{dy}{dx} = 3x^2 + y^2$$

$$\Rightarrow \frac{dy}{dx} = \frac{3x^2 + y^2}{2y(4-x)} \quad \text{@ } (2, 2), \frac{dy}{dx} = \frac{3 \cdot 2^2 + 2^2}{2 \cdot 2 \cdot (4-2)} = 2$$

2.5-32. $x^3 + y^3 - 6xy = 0$ point: $(\frac{4}{3}, \frac{8}{3})$

$$3x^2 + 3y^2 \frac{dy}{dx} - 6(y + x \frac{dy}{dx}) = 0$$

$$3y^2 \frac{dy}{dx} - 6x \frac{dy}{dx} = -3x^2 + 6y$$

$$(3y^2 - 6x) \frac{dy}{dx} = -3x^2 + 6y$$

$$\frac{dy}{dx} = \frac{-3x^2 + 6y}{3y^2 - 6x}$$

$$\text{@ } (\frac{4}{3}, \frac{8}{3}), \quad \frac{dy}{dx} = \frac{-3 \cdot (\frac{4}{3})^2 + 6 \cdot \frac{8}{3}}{3 \cdot (\frac{8}{3})^2 - 6 \cdot (\frac{4}{3})} =$$

42 a) $\frac{x^2}{6} - \frac{y^2}{8} = 1$ tangent line @ $(3, -2)$?

$$\frac{2x}{6} - \frac{2y}{8} \frac{dy}{dx} = 0$$

$$-\frac{y}{4} \frac{dy}{dx} = -\frac{x}{3}$$

$$\frac{dy}{dx} = \frac{4x}{3y}$$

$$\Rightarrow \text{@ } (3, -2), \quad \frac{dy}{dx} = \frac{4 \cdot 3}{3 \cdot (-2)} = -2$$

tangent line $y = -2x + b \Rightarrow -2 = -2 \cdot (3) + b$
 $4 = b \Rightarrow \boxed{y = -2x + 4}$