

## WORKSHEET ANSWERS

$$1) \quad 5x^2 - 6y^3 + 7x^2y = 9$$

$$10x - 18y^2 \frac{dy}{dx} + 7x^2 \frac{dy}{dx} + \overbrace{y \cdot 14x} = 0$$

$$(-18y^2 + 7x^2) \frac{dy}{dx} = -10x - 14xy$$

$$\frac{dy}{dx} = \frac{-10x - 14xy}{-18y^2 + 7x^2}$$

$$2) \quad \frac{5x^2}{x^3 y^2} = 7y(x^3 - y^2)$$

$$5x^2 = 7x^3y - 7y^3$$

$$10x = 7x^3 \frac{dy}{dx} + y \cdot 21x^2 - 21y^2 \frac{dy}{dx}$$

$$10x - 21x^2y = (7x^3 - 21y^2) \frac{dy}{dx}$$

$$\frac{10x - 21x^2y}{7x^3 - 21y^2} = \frac{dy}{dx}$$

$$3) \quad x^3 + y^3 - 6xy = 0$$

$$\text{SLOPE: } 3x^2 + 3y^2 \frac{dy}{dx} - \left(6x \frac{dy}{dx} + y \cdot 6\right) = 0$$

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

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

POINT:  $(\frac{4}{3}, \frac{8}{3})$

Eq:  $\frac{8}{3} = \frac{4}{5} \cdot \frac{4}{3} + b$

$$\frac{40}{15} - \frac{16}{15} = b$$

$$\frac{24}{15} = \frac{8}{5} = b$$

$$y = \frac{4}{5}x + \frac{8}{5}$$

$$\frac{dy}{dx} = \frac{-x^2 + 2y}{y^2 - 2x} = \frac{-\left(\frac{4}{3}\right)^2 + 2\left(\frac{8}{3}\right)}{\left(\frac{8}{3}\right)^2 - 2\left(\frac{4}{3}\right)}$$

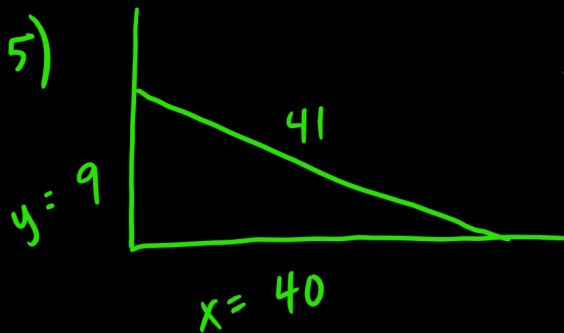
$$= \frac{-\frac{16}{9} + \frac{16}{3}}{\frac{64}{9} - \frac{8}{3}} = \frac{\frac{32}{9}}{\frac{40}{9}} = \frac{4}{5}$$

4)  $A = \pi r^2$   
 $\frac{dr}{dt} = 2$

$$\frac{dA}{dt} = 2\pi r \frac{dr}{dt}$$

a)  $\frac{dA}{dt} = 2\pi \cdot 6 \cdot 2 = 24\pi \text{ in}^2/\text{min}$

b)  $\frac{dA}{dt} = 2\pi \cdot 24 \cdot 2 = 96\pi \text{ in}^2/\text{min}$



$$x^2 + y^2 = 41^2$$

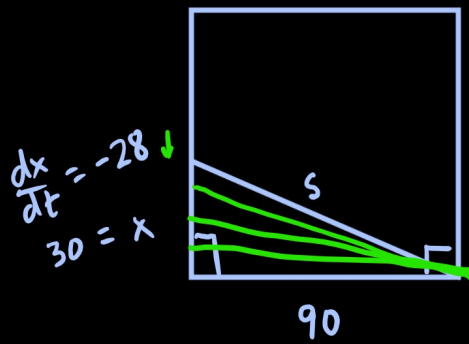
$$2x \frac{dx}{dt} + 2y \frac{dy}{dt} = 0$$

$$2 \cdot 40 \cdot \frac{dx}{dt} + 2 \cdot 9 \cdot 0.5 = 0$$

$$80 \frac{dx}{dt} = -9$$

$$\frac{dx}{dt} = -\frac{9}{80} \text{ ft/sec}$$

6)



$$x^2 + 90^2 = s^2$$

$$30^2 + 90^2 = s^2$$

$$2x \frac{dx}{dt} = 2s \frac{ds}{dt}$$

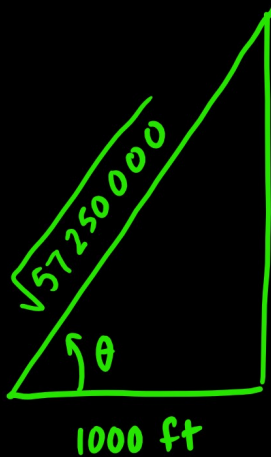
$$94.9 = s$$

$$2 \cdot 30 (-28) = 2(94.9) \frac{ds}{dt}$$

$$-1680 = 189.8 \frac{ds}{dt}$$

$$\frac{ds}{dt} = -8.85 \text{ ft/sec}$$

7)



$$\frac{dy}{dt} = 2500 \text{ ft/sec}$$

$$y = 7500 \text{ ft}$$

$$\tan \theta = \frac{y}{1000}$$

$$\sec^2 \theta \frac{d\theta}{dt} = \frac{1}{1000} \cdot \frac{dy}{dt}$$

$$\frac{57250000}{1000000} \frac{d\theta}{dt} = \frac{1}{1000} \cdot \frac{2500}{1}$$

$$\frac{d\theta}{dt} = \frac{10}{229} \frac{\text{rad}}{\text{sec}}$$

$$\sec^2 \theta = \left( \frac{\text{hyp}}{\text{adj}} \right)^2$$

$$10) \frac{dV}{dt} = 10 \text{ ft}^3/\text{min}$$

$$V = \frac{1}{3} \pi r^2 h$$

$$\frac{dh}{dt} = ?$$

$$h = 15$$

$$V = \frac{1}{3} \pi \left(\frac{3}{2}h\right)^2 h$$

$$V = \frac{1}{3} \pi \cdot \frac{9}{4} h^2 \cdot h$$

$$V = \frac{3}{4} \pi h^3$$

$$\frac{dV}{dt} = \frac{9}{4} \pi h^2 \frac{dh}{dt}$$

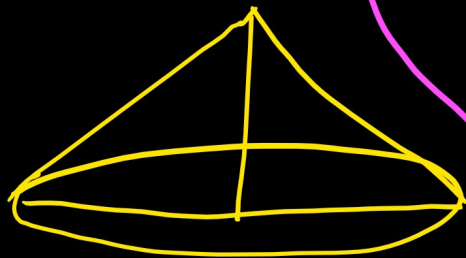
$$10 = \frac{9}{4} \pi \cdot 15^2 \frac{dh}{dt}$$

$$10 = \frac{9\pi \cdot 225}{4} \frac{dh}{dt}$$

$$\frac{2}{10} \cdot \frac{4}{9\pi \cdot 225} = \frac{dh}{dt}$$

$$\frac{dh}{dt} = \frac{8}{405\pi} \text{ ft}/\text{min}$$

$$= .0063 \text{ ft}/\text{min}$$



$$d = 3h$$

$$2r = 3h$$

$$r = \frac{3}{2}h$$