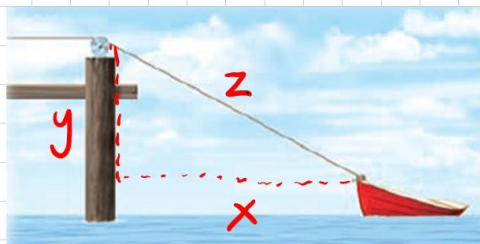


RELATED RATES EXAMPLES III

①



$$\frac{dz}{dt} = 2 \text{ ft/s}$$

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

$$z = 10 \text{ ft}$$

$$y = 6 \text{ ft}$$

②

LINKING EQUATION:

$$z^2 = x^2 + y^2$$

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

$$\frac{dy}{dt} = 0$$

$$2(10)(2 \text{ ft/s}) = 2(x) \frac{dx}{dt} + 0$$

$$40 = 2(\sqrt{64}) \frac{dx}{dt}$$

$$20 = \sqrt{64} \frac{dx}{dt}$$

$$\frac{dx}{dt} = \frac{20}{8} = \underline{\underline{2.5 \text{ ft/s}}}$$

FIND x:

$$z^2 = x^2 + y^2$$

$$100 = x^2 + 36$$

$$x = \sqrt{64}$$

EXAMPLE # 2

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

$$\text{DIAMETER} = 4h$$

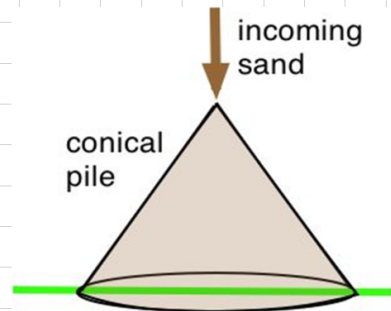
$$\text{RADIUS} = 2h$$

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

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

$$\frac{dV}{dt} = (1) \pi 4 h^2 \cdot \frac{dh}{dt}$$

$$12 = \pi 400 \frac{dh}{dt}$$



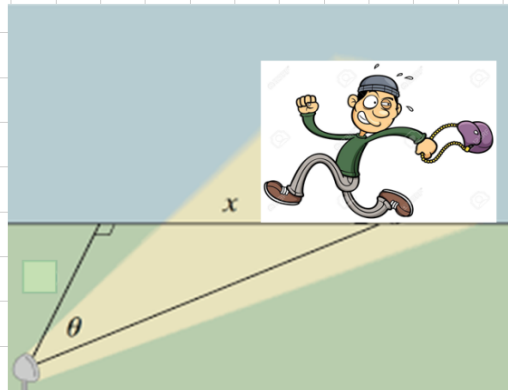
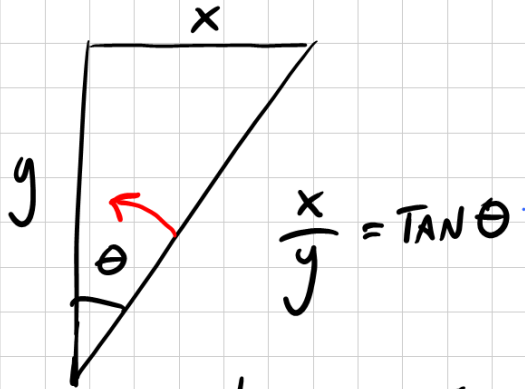
$$\text{Volume} = \frac{1}{3} \pi (\text{radius})^2 \text{height}$$

$$\frac{dV}{dt} = 12 \text{ ft}^3/\text{min}$$

$$h = 10 \text{ ft}$$

$$\frac{dh}{dt} = \frac{12}{\pi 400} = \frac{3}{100\pi}$$

Example #3



$$\frac{1}{10}x = \tan \theta$$
$$\frac{1}{10} \frac{dx}{dt} = \sec^2 \theta \frac{d\theta}{dt}$$

FIND θ :

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

$$\frac{1}{10}(-4) = \frac{1}{(\cos \theta)^2} \frac{d\theta}{dt}$$

$$\tan \theta = \frac{4}{5}$$

$$-\frac{4}{10} = \frac{1}{0.61} \frac{d\theta}{dt}$$

$$\theta = 38.65^\circ$$

$$\frac{d\theta}{dt} = \underline{\underline{0.244}} \text{ RADS/SEC}$$