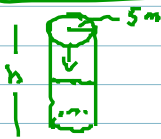


$l = 20 \text{ cm}$
 $w = 10 \text{ cm}$

$$A = lw$$

$$\frac{dA}{dt} = l \frac{dw}{dt} + w \frac{dl}{dt}$$

$$\frac{dA}{dt} \Big|_{t=20} = 20 \left(\frac{3}{10} \right) + 10 \left(\frac{8}{10} \right) = 60 + 80 = 140 \text{ cm}^2/\text{s}$$



$$V = \pi r^2 h$$

$$\frac{dV}{dt} = \pi r^2 \frac{dh}{dt} + 2\pi r \frac{dr}{dt} h$$

$$\frac{3 \text{ m}^3}{\text{min}} = \pi (5)^2 \frac{dh}{dt} + 2\pi (5) (10) \frac{dr}{dt}$$

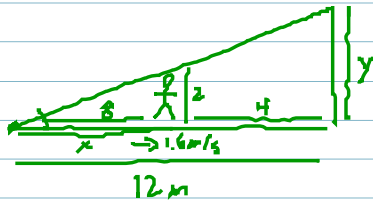
$$\frac{3 \text{ m}^3}{\text{min}} = 25\pi \text{ m}^2 \frac{dh}{dt}$$

$$\frac{dh}{dt} = \frac{3}{25\pi} \frac{\text{m}}{\text{min}}$$

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

$$\frac{dV}{dt} = \frac{4}{3} \pi 3r^2 \frac{dr}{dt} = 4\pi r^2 \frac{dr}{dt}$$

$$\frac{dV}{dt} \Big|_{r=80} = 4\pi (80 \text{ mm})^2 \frac{4 \text{ mm}}{5} = 16\pi (6400) \frac{\text{mm}^3}{5} = 102,400\pi \frac{\text{mm}^3}{5}$$



$$\frac{z}{x} = \frac{y}{12} \rightarrow 24 = xy$$

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

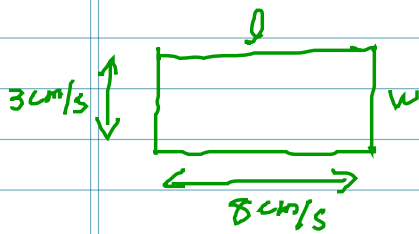
$$\frac{z}{8} = \frac{y}{12}$$

$$0 = 8 \frac{dy}{dt} + 3(1.6)$$

$$3m = y$$

$$0 = 8 \frac{dy}{dt} + 4.8$$

$$0.6 \frac{\text{m}}{\text{s}} = \frac{4.8}{8} \frac{\text{m}}{\text{s}} = \frac{dy}{dt} \Big|_{x=8}$$



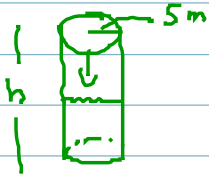
$$l = 20 \text{ cm}$$

$$w = 10 \text{ cm}$$

$$A = lw$$

$$\frac{dA}{dt} = l \frac{dw}{dt} + w \frac{dl}{dt}$$

$$\left. \frac{dA}{dt} \right|_{\substack{l=20 \\ w=10}} = 20 \left(\frac{cm}{s} \right) + 10 \left(\frac{cm}{s} \right) = 60 + 80 = 140 \text{ cm}^2/\text{s}$$



$$V = \pi r^2 h$$

$$\frac{dV}{dt} = \pi r^2 \frac{dh}{dt} + 2\pi r \frac{dr}{dt} h$$

$$\frac{3 \text{ m}^3}{\text{min}} = \pi (5)^2 \frac{dh}{dt} + 2\pi (5) (0) h$$

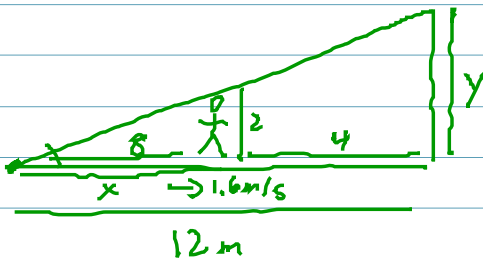
$$\frac{3 \text{ m}^3}{\text{min}} = 25\pi \text{ m}^2 \frac{dh}{dt}$$

$$\frac{dh}{dt} = \frac{3}{25\pi} \frac{\text{m}}{\text{min}}$$

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

$$\frac{dV}{dt} = \frac{4}{3} \pi 3r^2 \frac{dr}{dt} = 4\pi r^2 \frac{dr}{dt}$$

$$\left. \frac{dV}{dt} \right|_{r=80} = 4\pi (80 \text{ mm})^2 \frac{4 \text{ mm}}{5} = 16\pi (6400) \frac{\text{mm}^3}{5} = 102,400\pi \frac{\text{mm}^3}{5}$$



$$\frac{2}{x} = \frac{y}{12} \rightarrow 24 = xy$$

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

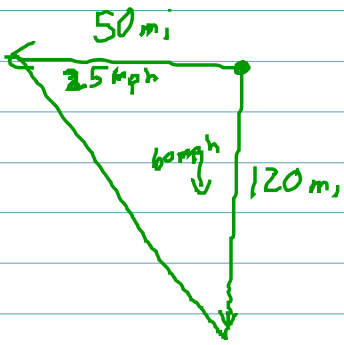
$$0 = 8 \frac{dy}{dt} + 3(1.6)$$

$$0 = 8 \frac{dy}{dt} + 4.8$$

$$0.6 \frac{\text{m}}{\text{s}} = \frac{4.8}{8} \frac{\text{m}}{\text{s}} = \frac{dy}{dt} \Big|_{x=8}$$

$$\frac{2}{8} = \frac{y}{12}$$

$$3 \text{ m} = y$$



$$d^2 = x^2 + y^2 \quad \rightarrow \quad d^2 = 50^2 + 120^2$$

$$= 2500 + 14400$$

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

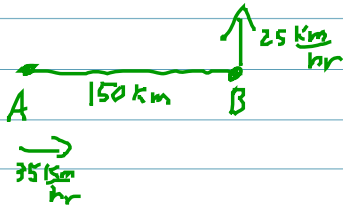
$$= 16900$$

$$(130 \text{ m}) \frac{dd}{dt} = 50 \text{ m} \left(\frac{25 \text{ m}}{\text{hr}} \right) + 120 \text{ m} \left(\frac{60 \text{ m}}{\text{hr}} \right)$$

$$= 1250 \frac{\text{m}^2}{\text{hr}} + 7200 \frac{\text{m}^2}{\text{hr}} = 8450 \frac{\text{m}^2}{\text{hr}}$$

$$\frac{dd}{dt} = \frac{8450 \text{ m}}{130 \text{ hr}} = 65 \frac{\text{m}}{\text{hr}}$$

noon



$$d^2 = x^2 + y^2$$

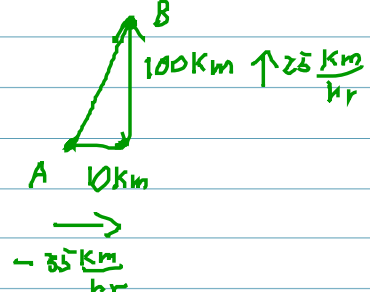
$$2d \frac{dd}{dt} = 2x \frac{dx}{dt} + 2y \frac{dy}{dt}$$

$$10\sqrt{101} \frac{dd}{dt} = 10(-35) + 100(25)$$

$$= -350 + 2500 = 2150$$

$$\frac{dd}{dt} = \frac{2150 \text{ km}}{10\sqrt{101} \text{ hr}} = \frac{215 \text{ km}}{\sqrt{101} \text{ hr}} = \frac{215\sqrt{101} \text{ km}}{101 \text{ hr}}$$

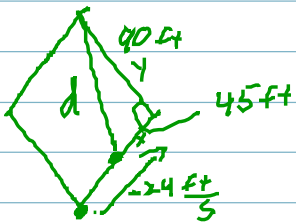
4:00 P.M



$$d^2 = 10^2 + 100^2$$

$$= 100 + 10000 = 10100$$

$$d = \pm \sqrt{10100} = \pm 10\sqrt{101} \rightarrow 10\sqrt{101}$$



$$d^2 = x^2 + y^2$$

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

$$45\sqrt{5} \frac{dd}{dt} = 45(-24) + 90(0)$$

$$= -1080$$

$$\frac{dd}{dt} = \frac{-1080 \text{ ft}}{45\sqrt{5} \text{ s}} = \frac{-24 \text{ ft}}{\sqrt{5} \text{ s}} = \frac{-24\sqrt{5} \text{ ft}}{5 \text{ s}}$$

$$d^2 = 45^2 + 90^2$$

$$= 2025 + 8100$$

$$= 10125$$

$$d = \pm 5\sqrt{405}$$

$$= 45\sqrt{5} \rightarrow 45\sqrt{5}$$