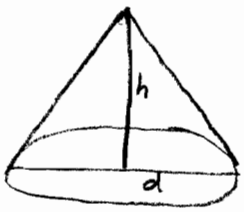
3-0235 — 50 SHEETS — 5 SQUARES
3-0236 — 100 SHEETS — 5 SQUARES
3-0237 — 200 SHEETS — 5 SQUARES
3-0137 — 200 SHEETS — FILLER
COMET

27)




Known: $h = d$ $\quad \frac{dV}{dt} = 30\ ft^3/min$

Find: $\frac{dh}{dt}$ when $h = 10$

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

since $h = d$, then $h = 2r$ and $r = \frac{h}{2}$

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

$$V = \frac{\pi}{12}h^3$$

$$\frac{dV}{dt} = \frac{\pi}{12}\cdot 3h^2\frac{dh}{dt}$$

$$\frac{dh}{dt} = \frac{dV}{dt}\cdot\frac{12}{3\pi h^2}$$

$\frac{dV}{dt} = 30\ ft^3/min$ & $h = 10$

$$\frac{dh}{dt} = 30\cdot\frac{12}{3\pi\cdot 100}$$

$$\boxed{\frac{dh}{dt} = \frac{12}{10} = \frac{6}{5\pi}\ ft/min}$$

$$\boxed{\frac{dh}{dt} \approx .38\ ft/min}$$

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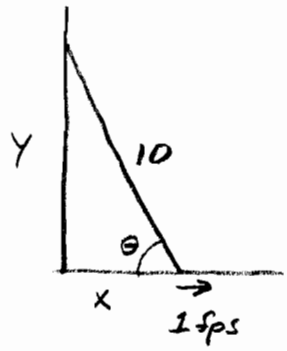
COMET

30)




Base of ladder slides away from wall at 1 fps, how fast is the angle between the ladder and floor changing when the base of the ladder is 6 feet from the wall?

Known: $\frac{dx}{dt} = 1$ fps $\quad z = 10$

Find: $\frac{d\theta}{dt}$ when $x = 6$

Relationship: $\cos\theta = \frac{adj}{hyp} = \frac{x}{10}$

$\cos\theta = x/10$

$10\cos\theta = x$

$\frac{d}{dt}(10\cos\theta) = \frac{d(x)}{dt}$

$-10\sin\theta \frac{d\theta}{dt} = \frac{dx}{dt}$

$\frac{d\theta}{dt} = \frac{1}{-10\sin\theta} \cdot \frac{dx}{dt}$

$\sin\theta = \frac{opp}{hyp} = \frac{y}{10}$ $\quad y = \sqrt{z^2 - x^2}$

$= \sqrt{100 - 36}$

$y = 8$

$\sin\theta = \frac{8}{10} = \frac{4}{5}$

$\frac{d\theta}{dt} = \frac{1}{-10\left(\frac{4}{5}\right)} \cdot 1$

$$\boxed{\frac{d\theta}{dt} = -\frac{1}{8} \text{ rad/sec} \approx 7.16 \text{ deg/sec}}$$

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COMET

31) Known: $\frac{dP}{dt} = 20 \text{ kPa/min}$

Find: $\frac{dV}{dt}$ when $P = 150 \text{ kPa}$ $V = 600 \text{ cm}^3$

Relationship: $PV = C$ where $C$ is a constant

Differentiate both sides w.r.t. $t$. (Use product Rule)

$$\frac{dP}{dt} V + \frac{dV}{dt} P = 0$$

$$\frac{dV}{dt} = -\frac{dP}{dt} \cdot \frac{V}{P}$$

$$\frac{dV}{dt} = -20 \frac{\text{kPa}}{\text{min}} \cdot \frac{600 \text{ cm}^3}{150 \text{ kPa}}$$

$$\frac{dV}{dt} = -80 \text{ cm}^3/\text{min}$$

$\therefore$ volume is decreasing at $80 \text{ cm}^3/\text{min}$.

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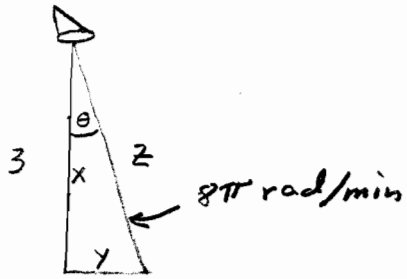
3-0236 — 100 SHEETS — 5 SQUARES
3-0237 — 200 SHEETS — 5 SQUARES
3-0137 — 200 SHEETS — FILLER
COMET

38)




Known: light 3 km from shore

$x = 3$

Rotates 4 times a min

$\frac{d\theta}{dt} = 4 \cdot 2\pi \frac{rad}{min} = 8\pi \frac{rad}{min}$

Find: $\frac{dy}{dt}$ when $y = 1$ km

Relationship: $\tan\theta = \frac{opp}{adj} = \frac{y}{3}$

$3\tan\theta = y$

$3\sec^2\theta \frac{d\theta}{dt} = \frac{dy}{dt}$

$\sec\theta = \frac{hyp}{adj} = \frac{z}{3}$

$z = \sqrt{3^2+1^2}$

$z = \sqrt{10}$

$\sec\theta = \frac{\sqrt{10}}{3} \Rightarrow \sec^2\theta = \frac{10}{9}$

$\frac{dy}{dt} = 3 \cdot \frac{10}{9} \cdot 8\pi \frac{km}{min}$

$$\boxed{\frac{dy}{dt} \approx 83.77 \text{ km/min}}$$