

Homework 14

①



$$\frac{dV}{dt} = -324\pi \text{ mm}^3/\text{sec}$$

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

$$V = 972\pi$$

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

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

$$-324\pi = 4\pi(9)^2 \frac{dr}{dt}$$

$$-324 = 324 \frac{dr}{dt}$$

$$\frac{dr}{dt} = -1 \text{ mm/sec}$$

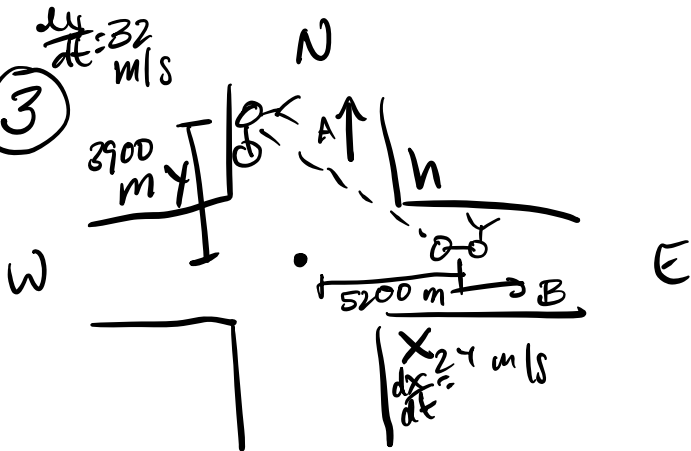
rate of decrease
1 mm/sec

$$972\pi = \frac{4}{3}\pi r^3$$

$$r^3 = 729$$

$$r = 9 \text{ mm}$$

③



$$x^2 + y^2 = h^2$$

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

$$2 \cdot 5200 \cdot 24 + 2 \cdot 3900 \cdot 32 = 2 \cdot 6500 \frac{dh}{dt}$$

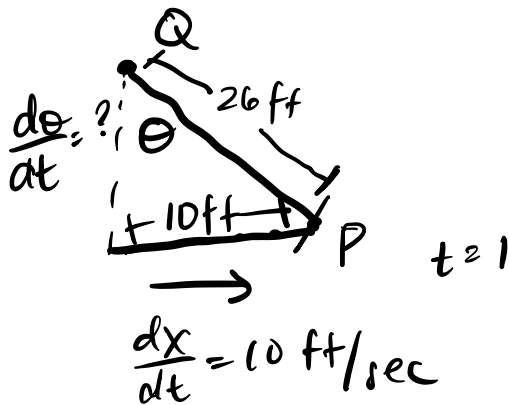
$$\frac{dh}{dt} = 38.4 \text{ m/s}$$

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$$3900^2 + 5200^2 = h^2$$

$$h = 6500 \text{ m}$$

④



$$\sin \theta = \frac{x}{h}$$

$$\sin \theta = \frac{x}{26}$$

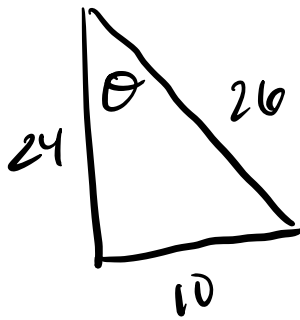
$$x = 26 \sin \theta$$

$$\frac{dx}{dt} = 26 \cos \theta \frac{d\theta}{dt}$$

$$10 = 26 \left(\frac{24}{26} \right) \frac{d\theta}{dt}$$

$$10 = 24 \frac{d\theta}{dt}$$

$$\frac{d\theta}{dt} = \frac{10}{24} = \frac{5}{12} \text{ rad/sec}$$

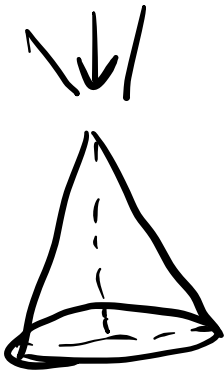


$$26^2 - 10^2 = y^2$$

$$y = 24$$

$$\cos \theta = \frac{24}{26}$$

⑧



$$h = d$$

$$\frac{dh}{dt} = 5 \text{ ft/min}$$

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

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

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

$$r = \frac{1}{2} h$$

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

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

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

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

$$\frac{dV}{dt} = \frac{\pi}{4} \cdot 10^2 \cdot 5$$

$$\frac{dV}{dt} = 125\pi \text{ ft}^3/\text{min}$$