Related Rates 3

8/

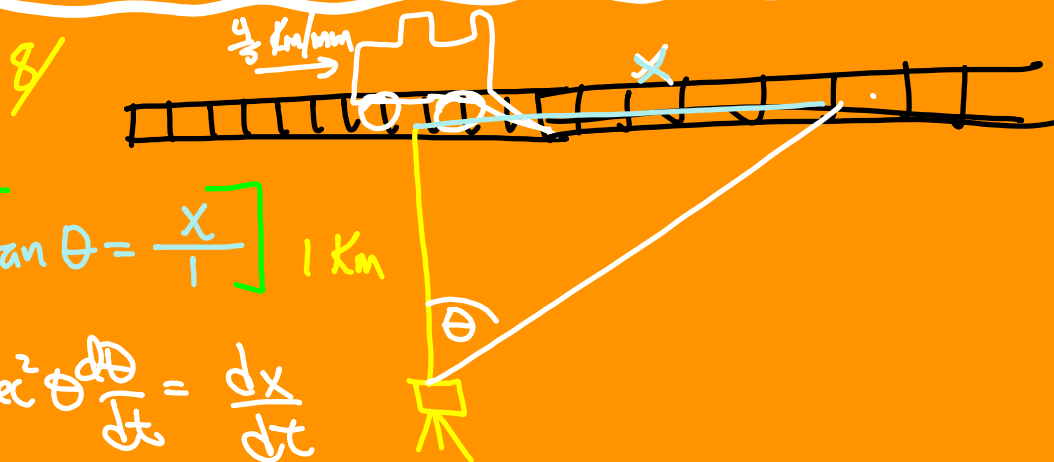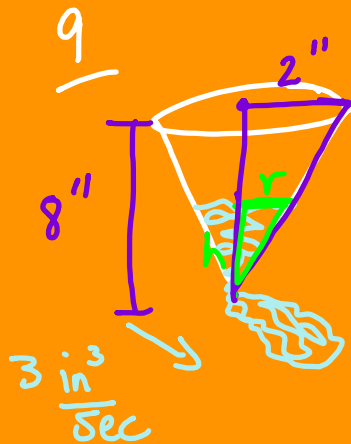$$\frac{d}{dt}\left[\tan\theta = \frac{x}{1}\right] \quad 1\ Km$$

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

$$\left(\sec\frac{\pi}{3}\right)^2\frac{d\theta}{dt} = \frac{4}{5}$$

$$(2)^2\frac{d\theta}{dt} = \frac{4}{5}$$

$$\frac{1}{4}\cdot 4\frac{d\theta}{dt} = \frac{4}{5}\cdot\frac{1}{4}$$

$$\frac{d\theta}{dt} = \frac{1}{5}\ \frac{rad}{min}$$

9

2"

8"

$3 \frac{in^3}{sec}$

$\dfrac{r}{2} = \dfrac{h}{8}$

$\dfrac{8r}{8} = \dfrac{2h}{8}$

$r = \dfrac{1}{4}h$

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

$V = \dfrac{1}{3}\pi\left(\dfrac{1}{4}h\right)^2 \cdot h$
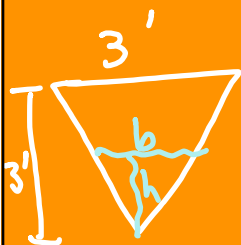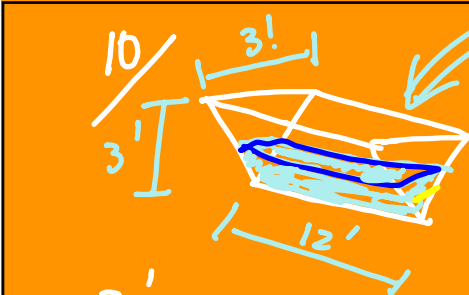
$\dfrac{1}{3}\pi\left(\dfrac{1}{16}h^2\right)h$

$\dfrac{d}{dt}\left[V = \dfrac{1}{48}\pi h^3\right]$

$\dfrac{dV}{dt} = \dfrac{1}{16}\pi h^2 \dfrac{dh}{dt}$

$-3 = \dfrac{1}{16}\pi(5)^2 \dfrac{dh}{dt}$

$\dfrac{16}{25\pi}\cdot -3 = \dfrac{25}{16}\pi \dfrac{dh}{dt}$

$\dfrac{-48}{25\pi}\dfrac{in}{sec} = \dfrac{dh}{dt}$

$$V = \tfrac{1}{2} bh \, l$$

$$V = \tfrac{1}{2} bh \,(12)$$

$$V = 6bh$$

$$V = 6(h)(h)$$

$$V = 6h^2$$

$$\frac{3}{3} = \frac{b}{h}$$

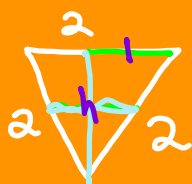$$\frac{3h}{3} = \frac{3b}{3}$$

$$h = b$$

$$\frac{dV}{dt} = 12h \, \frac{dh}{dt}$$
$$\text{ft}$$

$$10 = 12(2) \frac{dh}{dt}$$
$$\text{ft}^3/\text{min} \quad \text{ft} \quad \text{ft}$$

$$\frac{10}{24} = \frac{dh}{dt}$$

$$\boxed{\frac{5}{12} \, \frac{\text{ft}}{\text{min}} = \frac{dh}{dt}}$$

#9 Watch units!

#11

2

$1^2 + h^2 = 2^2$ $\sqrt{3}$ $\boxed{60°}$ 1 $30°$ 2 $4\sqrt{3}$ $\boxed{4}$ 60 30 8

2 h 2

50

θ

500 m
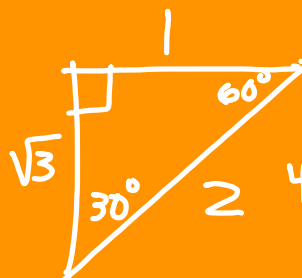
Revolves 4 times each min.

$\theta = 2\pi \cdot 4 = 8\pi \dfrac{rad}{min}$