RELATED RATES 2
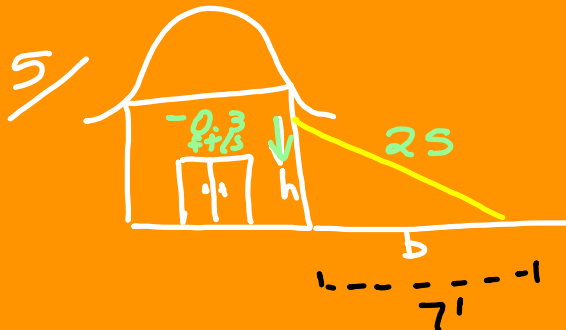

5/

$$A = \frac{1}{2}bh$$

$$\frac{dA}{dt} = \frac{1}{2}\left[b \cdot \frac{dh}{dt} + h\frac{db}{dt}\right]$$

$$\frac{dA}{dt} = \frac{1}{2}\left[7 \cdot (-0.3) + 24 \cdot \frac{36}{35}\right]$$

$$\approx 11.29 \ ft^2/sec$$

$$h^2 + 7^2 = 25^2$$
$$h^2 + 49 = 625$$
$$h^2 = 576$$
$$h = 24$$

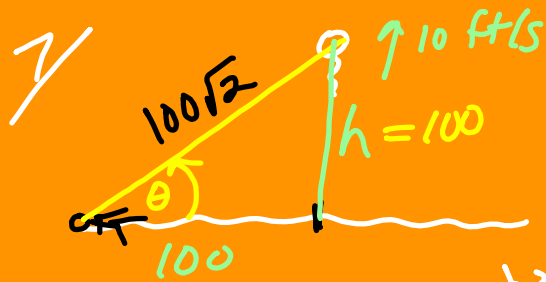$$h^2 + b^2 = 25^2$$
$$\frac{d}{dt}\left[h^2 + b^2 = 625\right]$$
$$2h\frac{dh}{dt} + 2b\frac{db}{dt} = 0$$
$$2(24)(-0.3) + 2(7)\frac{db}{dt} = 0$$
$$-14.4 + 14\frac{db}{dt} = 0$$
$$\frac{db}{dt} = \frac{14.4}{14}$$
$$= \frac{144}{140} = \frac{72}{70} = \frac{36}{35}$$

Similar Δ's

6/

20

6

4.4 ft/s   S

x

w

$\dfrac{h}{b}$ a) $\dfrac{20}{x+s} = \dfrac{6}{s}$

$20s = 6x + 6s$

$-6s \qquad\qquad -6s$

$14s = 6x$

$14\dfrac{ds}{dt} = 6\dfrac{dx}{dt}$

$14\dfrac{ds}{dt} = 6(4.4)$

$14\dfrac{ds}{dt} = \dfrac{26.4}{14}$

$\boxed{\dfrac{ds}{dt} = \dfrac{66}{35} \approx 1.89 \dfrac{ft}{s}}$

b)

$w = x + s$

$\dfrac{dw}{dt} = \dfrac{dx}{dt} + \dfrac{ds}{dt}$

$\quad = 4.4 + 1.89$

$\quad = 6.29 \text{ ft/s}$

↑ 10 ft/s

$h = 100$

$100\sqrt{2}$

θ

100

$\tan\theta = \dfrac{h}{100}$

$\dfrac{1}{100}h$
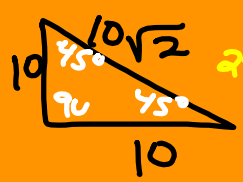
$\sec^2\theta \dfrac{d\theta}{dt} = \dfrac{1}{100}\dfrac{dh}{dt}$

$\left(\dfrac{100\sqrt{2}}{100}\right)^2 \dfrac{d\theta}{dt} = \dfrac{1}{100}(10)\dfrac{ft}{s}$
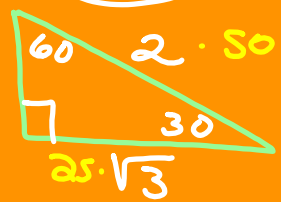
$\sec\theta = \dfrac{hyp}{adj}$

$\dfrac{1}{\sqrt{2}} \cdot 2 \dfrac{d\theta}{dt} = \dfrac{1}{10} \cdot \dfrac{1}{2}$

$\dfrac{d\theta}{dt} = \dfrac{1}{20} \dfrac{rad}{sec}$

$10\sqrt{2}$ 10 $45°$ 90 $45°$ 10

25 60 $2 \cdot 50$ 30 $25 \cdot \sqrt{3}$