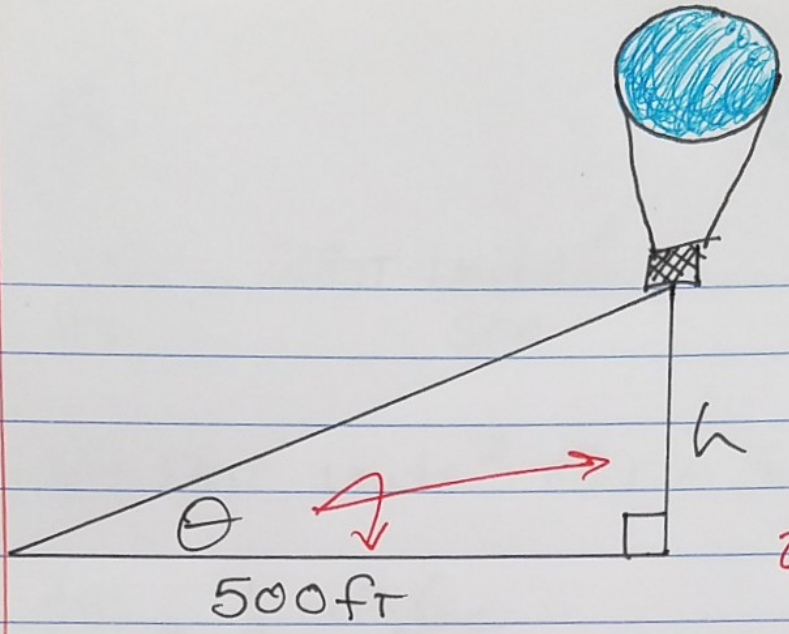


$\theta = \frac{\pi}{4}$

$\frac{d\theta}{dt} = 0.14 \frac{rad}{min}$

$\tan\theta = \frac{h}{500ft}$

$$\tan\theta = \frac{h}{500ft}$$

$$500\tan\theta = h$$

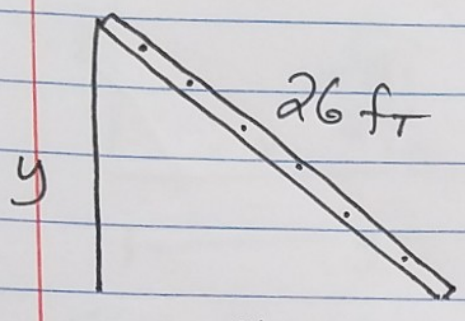
$$500\sec^2\theta\left(\frac{d\theta}{dt}\right) = \frac{dh}{dt}$$

$$500\sec^2\left(\frac{\pi}{4}\right)(0.14rad) = \frac{dh}{dt}$$

$$500\left(\sqrt{2}\right)^2(0.14\frac{rad}{min}) = \frac{dh}{dt}$$

$$= 140\frac{ft}{min}$$

EXAMPLE 1 $\quad \frac{dx}{dt} = 4 \frac{ft}{sec}$



Find $\frac{dy}{dt}$ @ $x = 10$

$x^2 + y^2 = 26^2$

$2x\left(\frac{dx}{dt}\right) + 2y\left(\frac{dy}{dt}\right)$

Find $\frac{dy}{dt}$ in terms of x!

$y^2 = 26^2 - x^2$

$y = \sqrt{26^2 - x^2}$

$y = \sqrt{26^2 - 10^2}$

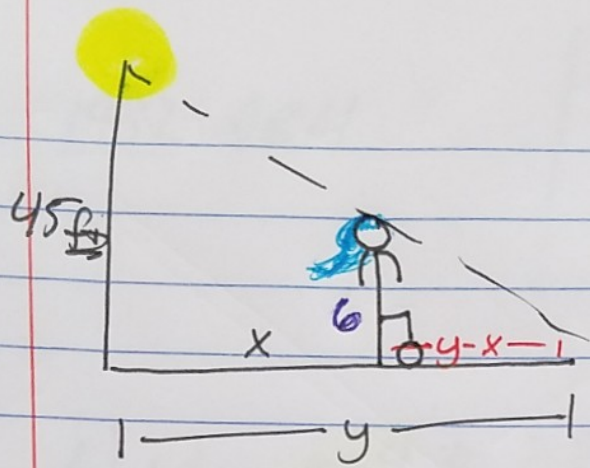
$y = 24$

$2x\left(\frac{dx}{dt}\right) + 2y\left(\frac{dy}{dt}\right)$

$2(10)\left(4 \frac{ft}{sec}\right) + 2(24)\left(\frac{dy}{dt}\right) = 0$

$48\left(\frac{dy}{dt}\right) = -80 \frac{ft}{sec}$

$\frac{dy}{dt} = \frac{-5}{3} \frac{ft}{sec}$



$\frac{dx}{dt} = 3 \frac{ft}{sec}$

Find $\frac{dy}{dt}$ @ $x = 25 ft$

Similar Δ's

$\frac{6}{y-x} = \frac{45}{y}$

$6y = 45(y-x)$

$6y = 45y - 45x$

$0 = 39y - 45x$

$0 = 39\left(\frac{dy}{dt}\right) - 45\left(\frac{dx}{dt}\right)$

$0 = 39\left(\frac{dy}{dt}\right) - 45\left(3 \frac{ft}{sec}\right)$

$\frac{45(3)}{39} = \frac{dy}{dt} = \left(\frac{45}{13}\right) \frac{ft}{sec}$

Find out $\frac{d[\text{shadow}]}{dt} = \frac{d(y-x)}{dt}$

$\frac{d(y-x)}{dt} = \frac{dy}{dt} - \frac{dx}{dt}$

$= \left(\frac{45}{13}\right) \frac{ft}{sec} - (3) \frac{ft}{sec}$

$= \frac{6}{13} \frac{ft}{sec}$