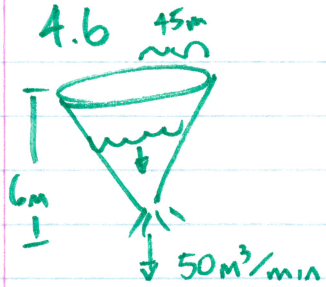
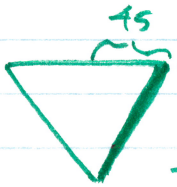
4.6

(17)



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



$\frac{r}{45} = \frac{h}{6}$

$r = \frac{45}{6}h$

(a) $V = \frac{1}{3}\pi\left(\frac{45}{6}h\right)^2 h$

$V = \frac{45^2}{108}\pi h^3$

$\frac{dV}{dt} = \frac{45^2}{36}\pi h^2 \frac{dh}{dt}$

$-50 = \frac{\frac{45^2}{36}\pi(5)^2 \frac{dh}{dt}}{\frac{45^2}{36}\pi(5)^2}$

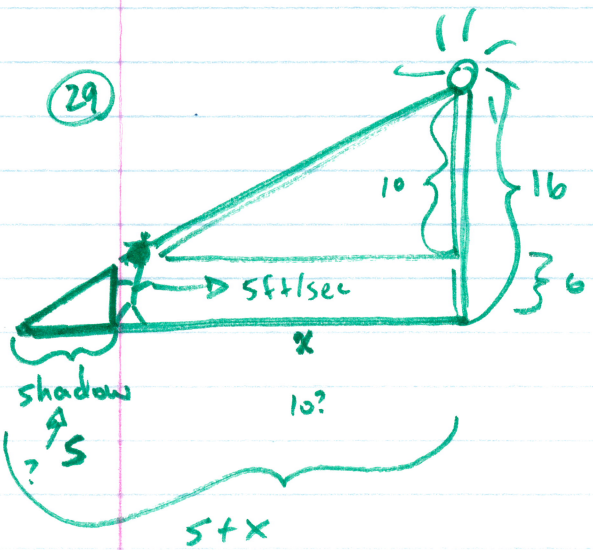
$\frac{-50 \cdot 36}{45^2\pi(5)^2} = \frac{dh}{dt}$ $\quad \frac{-8}{9\pi}$ m/min $\cdot \frac{100}{4}$ cm/m $= \frac{-32}{9\pi} \approx -1.132$ cm/min

$\frac{dr}{dt} = \frac{45}{6}\frac{dh}{dt}$

(b) $= \frac{45}{6} \cdot \frac{-32}{9\pi}$

$= \frac{-80}{3\pi}$ cm/min

(29)



$\frac{5}{6} = \frac{5+x}{16}$

$16s = 6s + 6x$

$-6s \quad -6s$

$10s = 6x$

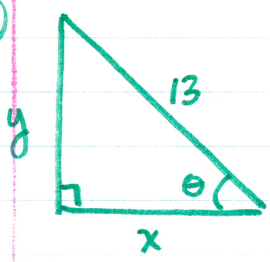
$10\frac{ds}{dt} = 6\frac{dx}{dt}$

$\frac{10\frac{ds}{dt}}{10} = \frac{6(5)}{10}$

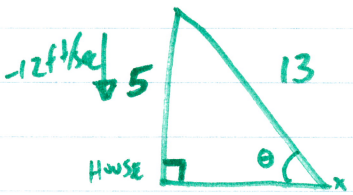
$\frac{ds}{dt} = -3$ ft/sec

4.6

(19)



ALWAYS



5 ft/sec MOMENT IN TIME

(a) $x^2 + y^2 = 13^2$

$2x\frac{dx}{dt} + 2y\frac{dy}{dt} = 0$

$2(12)(5) + 2(5)\frac{dy}{dt} = 0$

-120

-120

$10\frac{dy}{dt} = -120$

$\frac{10}{10} \quad \frac{-120}{10}$

$\boxed{\frac{dy}{dt} = -12 \text{ ft/sec}}$

(c) $\cos\theta = \frac{x}{13}$

$-\sin\theta\frac{d\theta}{dt} = \frac{1}{13}\frac{dx}{dt}$

$-\frac{13}{5}\cdot\frac{5}{13}\frac{d\theta}{dt} = \frac{1}{13}(5)\cdot\frac{-13}{5}$

$\boxed{\frac{d\theta}{dt} = -1 \text{ radians/sec}}$

(b) $A = \underbrace{\frac{1}{2}xy}_{f \quad g}$

$\frac{dA}{dt} = \frac{1}{2}y\frac{dx}{dt} + \frac{1}{2}x\frac{dy}{dt}$

$= \frac{1}{2}(5)(5) + \frac{1}{2}(12)(-12)$

$= \frac{25}{2} - \frac{144}{2} = \boxed{\frac{-119}{2} \text{ ft}^2/\text{sec}}$