4.6 / (3)

a. $V = \pi r^2 h$

$$\frac{dV}{dt} = 2\pi r h \frac{dr}{dt} + \pi r^2 \frac{dh}{dt}$$

b. $h = 6, \frac{dh}{dt} = 1, r = 10, \frac{dr}{dt} = -1$

$$\frac{dV}{dt} = 2\pi(10)(6)(-1) + \pi(10^2)1$$

$$= -120\pi + 100\pi = -20\pi \text{ in}^3/\text{s}$$

$\frac{dV}{dt} < 0$, so volume is decreasing

(8) $A = \pi r^2$

$$\frac{dA}{dt} = 2\pi r \frac{dr}{dt}$$

$\frac{dr}{dt} = 3$ and is constant

$\therefore r = \frac{dr}{dt} t$. When $t = 10$, $r = 30$

(still pond means $r(0) = 0$)

$$\frac{dA}{dt} = 2\pi(30)3 = 180\pi \text{ ft}^2/\text{s}$$

(10) $V = \frac{4}{3}\pi r^3 \rightarrow r = \frac{D}{2}$

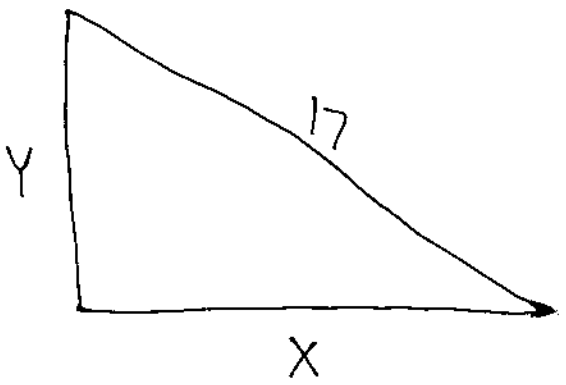
$V = \frac{4}{3}\pi\left(\frac{D}{2}\right)^3 = \frac{4}{3}\pi\frac{D^3}{8} = \frac{1}{6}\pi D^3$

$\frac{dV}{dt} = \frac{1}{2}\pi D^2 \frac{dD}{dt} \rightarrow \frac{dD}{dt} = \frac{2\frac{dV}{dt}}{\pi D^2}$

$\frac{dV}{dt} = 3, \quad r = 1 \rightarrow D = 2$

$\frac{dD}{dt} = \frac{2 \cdot 3}{\pi 2^2} = \frac{3}{2\pi}$ ft/min

(12)



GIVEN: $\frac{dx}{dt} = 5$

$$X^2 + Y^2 = 17^2$$

$$2X\frac{dx}{dt} + 2Y\frac{dy}{dt} = 0$$

$$\frac{dy}{dt} = \frac{-2x\, dx/dt}{2Y} = \frac{-x\,\frac{dx}{dt}}{Y}$$

$Y = 8 \longrightarrow 17^2 - 8^2 = x^2$

$x = 15$

$$\frac{dy}{dt} = \frac{-15 \cdot 5}{8} = -\frac{75}{8}\ ft/s$$