1) $\frac{dr}{dt} = -4\,cm/sec$

$\frac{dv}{dt} = ?$

$r = 3cm$

$d = 6cm$

$V = \left(\frac{4}{3}\pi\right)r^3$

$\frac{dv}{dt} = 4\pi r^2 \cdot \frac{dr}{dt}$

$\frac{dv}{dt} = 4\pi(3)^2(-4)$

$\frac{dv}{dt} = 36(-4\pi)$

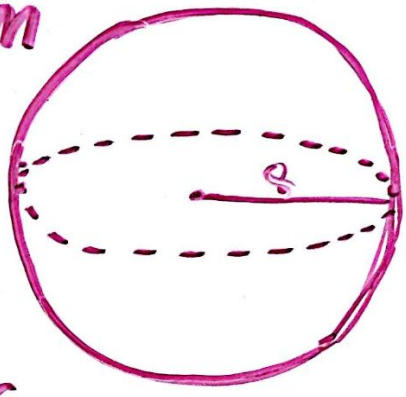
$\frac{dv}{dt} = -144\pi\,cm^3/sec$

2.

$$\frac{dv}{dt} = \frac{256\pi}{3} \text{ cm}^3/\text{sec}$$

$$\frac{dr}{dt} = ?$$

when radius = 8 cm



$$V = \frac{4}{3}\pi r^3$$

$$\frac{dv}{dt} = 4\pi r^2 \cdot \frac{dr}{dt}$$

$$-\frac{256\pi}{3} = 4\pi(8)^2 \cdot \frac{dr}{dt}$$

$$\frac{-256\pi}{3} = 256\pi \cdot \frac{dr}{dt}$$

$$\frac{256\pi}{256\pi}$$

$$\boxed{-1/3 = dr/dt}$$

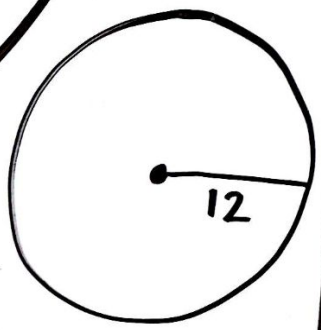
3) $\frac{dr}{dt} = 9\text{ cm/min}$ $r = 12\text{ cm}$

$A = \pi r^2$

$\frac{dA}{dt} = ?$

$\frac{dA}{dt} = 2\pi r\left(\frac{dr}{dt}\right)$

$\frac{dA}{dt} = 2\pi(12)(9)$



$\frac{dA}{dt} = 216\pi\text{ cm}^2/\text{min}$

4) $\frac{dy}{dt} = -7 \text{ ft/sec}$ $\frac{dx}{dt} = ?$

$x^2 + y^2 = z^2$

$12^2 + y^2 = 13^2$

$y = 5$

$x^2 + y^2 = z^2$

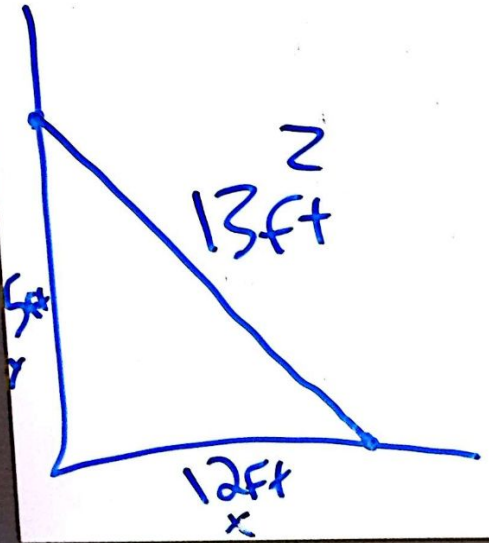
$2x\frac{dx}{dt} + 2y\frac{dy}{dt} = 0$

$2x\frac{dx}{dt} + 2y(-7) = 0$

$2x\frac{dx}{dt} - 14y = 0$

$2x\frac{dx}{dt} = 14y$

$\frac{dx}{dt} = \frac{14y}{2x} = \frac{7y}{x}$



$\frac{7y}{x} = \frac{7(5)}{12} = \boxed{\frac{35}{12}}$

5.

$$\frac{dr}{dt} = 2\ m/min$$

$r = 13m$

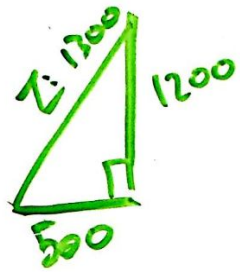
$\frac{da}{dt} = ?$

$$\frac{da}{dt} = \pi r^2$$

$$\frac{da}{dt} = 2\pi r 2(13)$$

$$\frac{da}{dt} = 52\pi \frac{m^2}{min}$$

6)



$\sqrt{1200^2 + 500^2} = 1300$

$\frac{dy}{dt} = 700$ ft/sec

$\frac{dz}{dt}$

$\frac{dx}{dt} = 0$ ft/sec

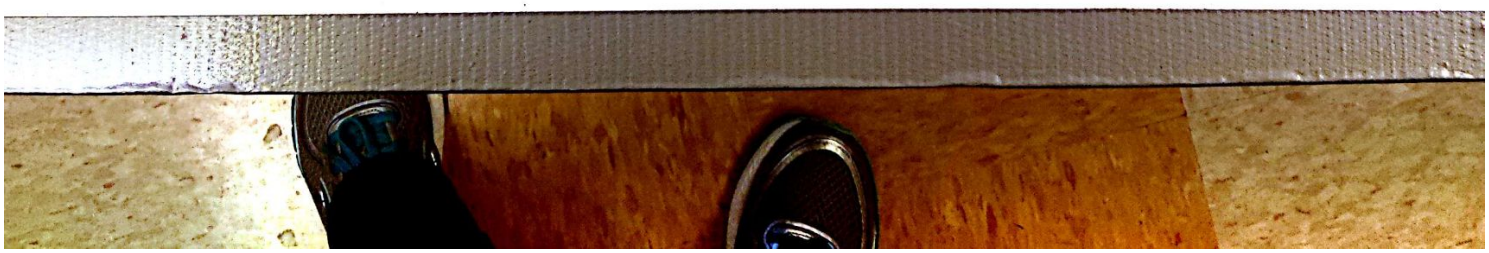
$x^2 + y^2 = z^2$

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

$2(500)(0) + 2(1200)(700) = 2(1300)(\frac{dz}{dt})$

$x = \frac{2(1200)(700)}{2(1300)} \rightarrow \frac{8400}{13}$ ft/sec

$\frac{8400}{13}$ ft/sec



7) $\frac{dV}{dt} = -36\pi$

$\frac{dr}{dt} = ?$

$r = 5$

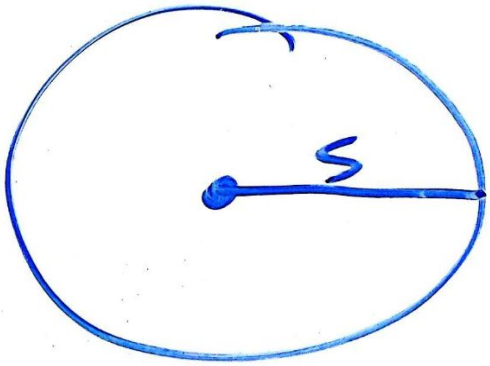
$V = \frac{4}{3}\pi r^3$

$\frac{dV}{dt} = 4\pi r^2 \cdot \frac{dr}{dt}$

$-36\pi = 4\pi (5)^2 \cdot \frac{dr}{dt}$

$\frac{-36\pi}{100\pi} = \frac{100\pi}{100\pi} \frac{dr}{dt}$

$\frac{dr}{dt} = \frac{-9}{25}$ in/s



8. $A = \pi r^2$

$\frac{dr}{dt} = -8 \text{ in/hr}$

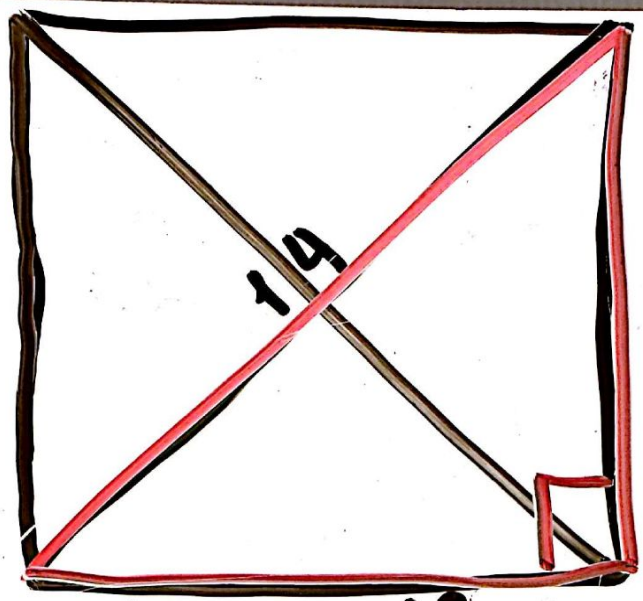
$\frac{dA}{dt} = ? \Big|_{r=3}$

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

$\frac{dA}{dt} = \pi \cdot 2(3) \cdot -8$

$\boxed{\frac{dA}{dt} = -48\pi \text{ in}^2/\text{hr}}$

9)



$A_{sq} = \frac{1}{2} \cdot d \cdot d$

$d^2 = l^2 + l^2$

$d^2 = 2l^2$

Area $= l^2$

$2l^2 = D^2$ $\quad A = l^2$

* $A = \frac{D^2}{2}$ $\quad \frac{1}{2} \cdot D^2$

$\frac{dA}{dt} = \frac{1}{2} 2D \frac{dD}{dt} =$ **56 m²/min**

$D = 14$ $\quad \frac{dD}{dt} = 4$