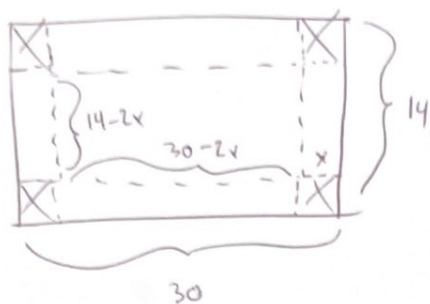


1.



$$0 < x < 7$$

$$V'(x) = -176 + 24x$$

$$V''(3) = -176 + 24(3) = -104 < 0$$

MAX

$$V = x(30-2x)(14-2x)$$

$$V = 420x - 88x^2 + 4x^3$$

$$V' = 420 - 176x + 12x^2 = 0$$

$$3x^2 - 44x + 105 = 0$$

$$(3x-35)(x-3) = 0$$

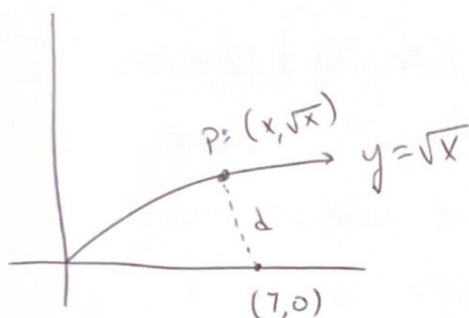
$$x = 3$$

$$x = \frac{35}{3}$$

NO

3x3 inch squares

2.



$$d = \sqrt{(x-7)^2 + (\sqrt{x}-0)^2}$$

$$d = \sqrt{x^2 - 14x + 49 + x}$$

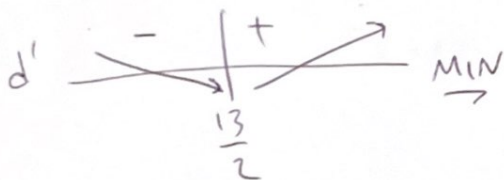
$$d = \sqrt{x^2 - 13x + 49}$$

$$d' = \frac{2x-13}{2\sqrt{x^2-13x+49}} = 0$$

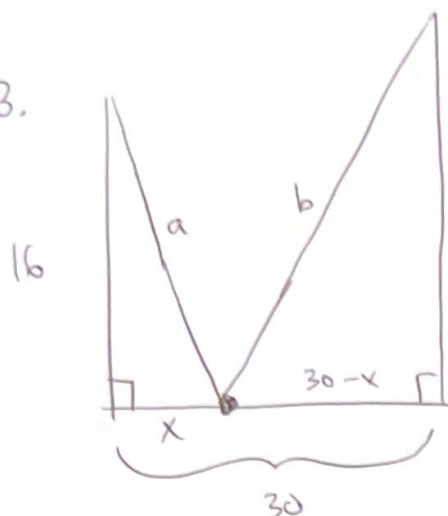
$$2x-13=0, \quad x = \frac{13}{2}$$

$$y\left(\frac{13}{2}\right) = \sqrt{\frac{13}{2}}$$

$$\left(\frac{13}{2}, \sqrt{\frac{13}{2}}\right)$$



3.



$$l = a + b = \sqrt{x^2 + 16^2} + \sqrt{(30-x)^2 + 24^2}$$

$$24 \quad l = \sqrt{x^2 + 256} + \sqrt{x^2 - 60x + 1476}$$

$$l' = \frac{2x}{2\sqrt{x^2 + 256}} + \frac{2x - 60}{2\sqrt{x^2 - 60x + 1476}}$$

$$= \frac{x}{\sqrt{x^2 + 256}} + \frac{x - 30}{\sqrt{x^2 - 60x + 1476}}$$

$$= \frac{x\sqrt{x^2 - 60x + 1476} + (x - 30)\sqrt{x^2 + 256}}{\sqrt{x^2 + 256}\sqrt{x^2 - 60x + 1476}} = 0$$

$$\left[x\sqrt{x^2 - 60x + 1476} \right]^2 = \left[-\sqrt{x^2 + 256}(x - 30) \right]^2$$

$$x^2(x^2 - 60x + 1476) = (x^2 + 256)(x^2 - 60x + 900)$$

$$x^4 - 60x^3 + 1476x^2 = x^4 - 60x^3 + 1156x^2 - 15360x + 230400$$

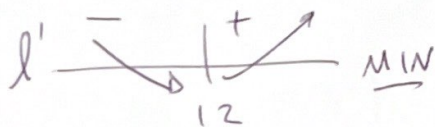
$$320x^2 + 15360x - 230400 = 0$$

$$x^2 + 48x - 720 = 0$$

$$(x - 12)(x + 60) = 0$$

$$x = 12 \quad x = \cancel{60}$$

NO



12 feet away from the sixteen foot pole

4. $A = \pi r^2$ $\frac{dr}{dt} = 4 \text{ cm/min}$ $r = 5 \text{ cm}$ $\frac{dA}{dt} = ?$

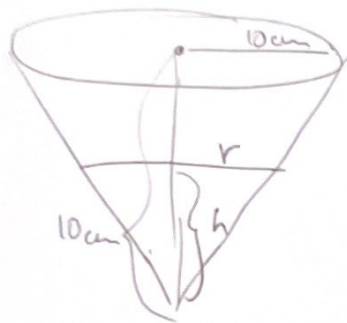
$$\frac{dA}{dt} = 2\pi r \frac{dr}{dt} = 2\pi(5)(4) = \boxed{40\pi \text{ cm}^2/\text{min}}$$

5. $A = \pi r^2$ $\frac{dA}{dt} = 9\pi \text{ m}^2/\text{min}$ $r = 10 \text{ m}$ $\frac{dr}{dt} = ?$

$$\frac{dA}{dt} = 2\pi r \frac{dr}{dt} \Rightarrow 9\pi = 2\pi(10) \frac{dr}{dt}$$

$$\Rightarrow \boxed{\frac{dr}{dt} = \frac{9}{20} \text{ m/min}}$$

6.



$$\frac{r}{10} = \frac{h}{10} \Rightarrow r = h$$

$$\frac{dh}{dt} = 2 \text{ cm/sec} \quad h = 8 \text{ cm}$$

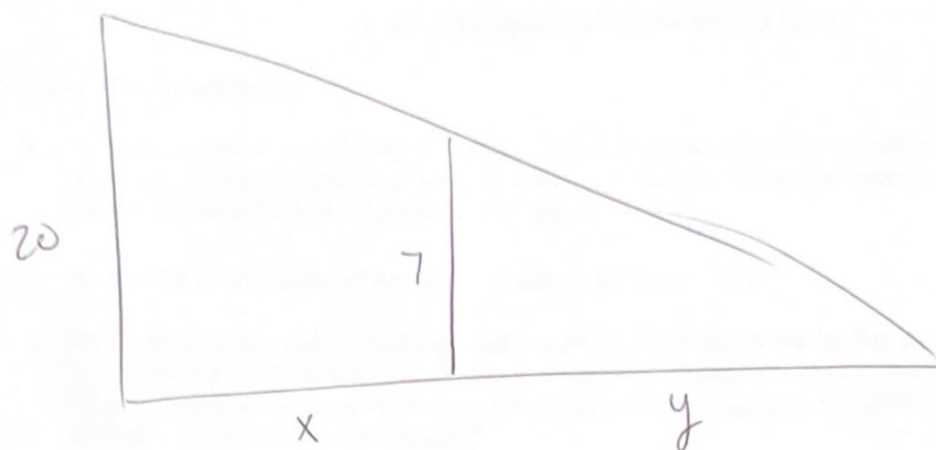
$$\frac{dV}{dt} = ?$$

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

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

$$\frac{dV}{dt} = \pi(8^2)(2) = \boxed{128\pi \text{ cm}^3/\text{sec}}$$

7.



$$\frac{dx}{dt} = 5 \text{ ft/sec} \quad x = 16 \text{ ft}$$

$$\frac{x+y}{20} = \frac{y}{7} \Rightarrow 7x + 7y = 20y$$

$$\Rightarrow 7x = 13y$$

$$7 \frac{dx}{dt} = 13 \frac{dy}{dt}$$

$$7(5) = 13 \frac{dy}{dt}$$

$$\boxed{\frac{dy}{dt} = \frac{35}{13} \text{ ft/sec}}$$