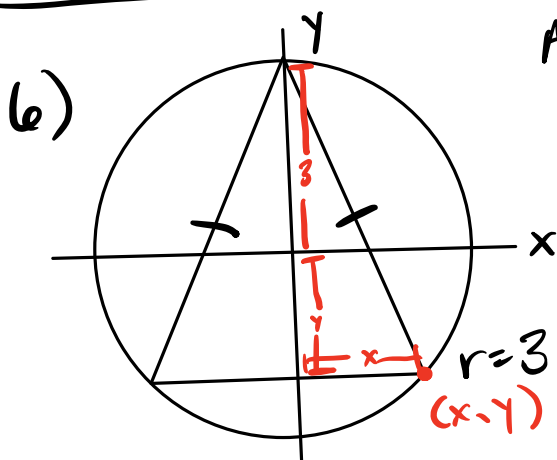


Homework 21



$$A_{\max} = ?$$

$$A = \frac{1}{2}bh$$

$$b = 2x$$

$$h = 3 + y$$

$$h = 3 - y$$

$$x^2 + y^2 = 9$$

$$x = \sqrt{9 - y^2}$$

$$y = -\frac{3}{2}$$

$$x = \sqrt{9 - \left(-\frac{3}{2}\right)^2}$$

$$x = \sqrt{9 - \frac{9}{4}}$$

$$x = \sqrt{\frac{36-9}{4}}$$

$$x = \sqrt{\frac{27}{4}}$$

$$x = \frac{3\sqrt{3}}{2}$$

$$A = x(3-y)$$

$$A = \frac{3\sqrt{3}}{2} \left(3 + \frac{3}{2}\right)$$

$$A = \frac{3\sqrt{3}}{2} \left(\frac{6+3}{2}\right)$$

$$A = \frac{3\sqrt{3}}{2} \cdot \frac{9}{2}$$

$$A = \frac{27\sqrt{3}}{4}$$

$$A = \frac{1}{2} \cdot 2x(3-y)$$

$$A = x(3-y)$$

$$A = \sqrt{9-y^2}(3-y)$$

$$\frac{dA}{dy} = \sqrt{9-y^2}(-1) + (3-y) \cdot \frac{1}{2}(9-y^2)^{-\frac{1}{2}} \cdot -2y$$

$$0 = -\sqrt{9-y^2} + \frac{-y(3-y)}{\sqrt{9-y^2}}$$

$$\left(\frac{19-y^2}{\sqrt{9-y^2}}\right) \cdot \frac{-y(3-y)}{\sqrt{9-y^2}}$$

$$0 = \frac{-(9-y^2) - y(3-y)}{\sqrt{9-y^2}}$$

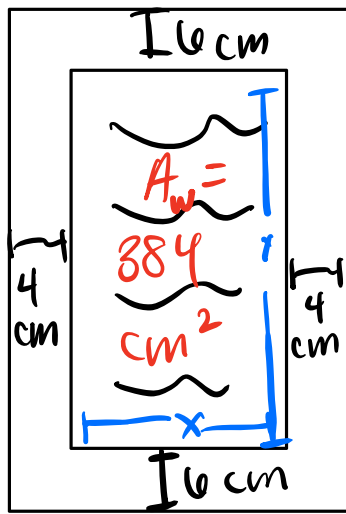
$$0 = -9 + y^2 - 3y + y^2$$

$$0 = 2y^2 - 3y + 9$$

$$0 = (2y+3)(y-3)$$

$$y = -\frac{3}{2} \quad y = 3$$

7)



$$A_p = (x+4+4)(y+6+6) \quad A_w = xy$$

$$A_p = (x+8)(y+12)$$

$$384 = xy$$

$$A_p = (x+8)(384x^{-1} + 12) \quad y = \frac{384}{x}$$

$$\frac{dA_p}{dx} = (x+8)(-384x^{-2}) + (384x^{-1} + 12)$$

$$0 = \frac{-384(x+8)}{x^2} + \frac{384}{x} + 12$$

$$0 = \frac{-384(x+8) + 384x + 12x^2}{x^2}$$

$$0 = \cancel{-384x} - 3072 + \cancel{384x} + 12x^2$$

$$12x^2 = 3072$$

$$x^2 = 256$$

$$x = 16$$

$$y = \frac{384}{16}$$

$$y = 24$$

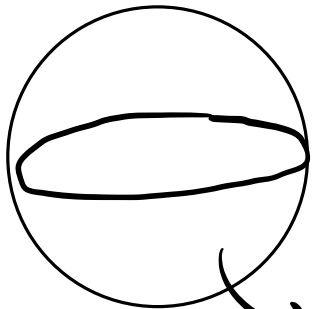
$$x_{\text{total}} = 16 + 4 + 4 = 24$$

$$y_{\text{total}} = 24 + 6 + 6 = 36$$

24 cm x 36 cm

Homework 14

① $\frac{dV}{dt} = 324\pi$ $\frac{dr}{dt} = ?$ $V = 972\pi$



$\frac{dV}{dt}$

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

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

$$-324\pi = 4\pi \cdot 9^2 \frac{dr}{dt}$$

$$-324 = 324 \frac{dr}{dt}$$

$$\frac{dr}{dt} = -1$$

rate of decrease : 1 mm/s

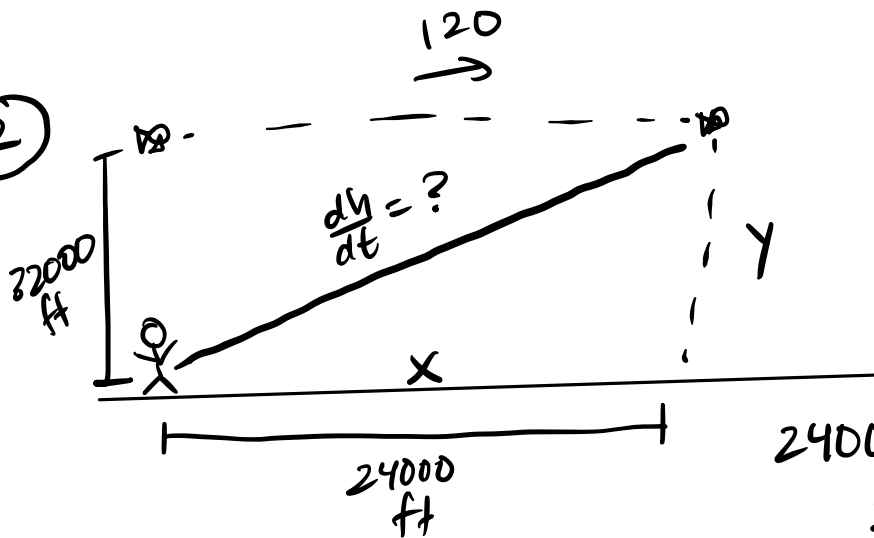
$$V = \frac{4}{3}\pi r^3$$

$$972\pi = \frac{4}{3}\pi r^3$$

$$r^3 = 729$$

$$r = 9$$

②



$$x^2 + y^2 = h^2$$

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

$$24000(120) + 32000(0) = 40000 \frac{dh}{dt}$$

$$2880000 = 40000 \frac{dh}{dt}$$

$$\frac{dh}{dt} = 72$$

$$24000^2 + 32000^2 = h^2$$

$$h = 40000$$