WS 3-4

Solutions : The Graph of a Rational Function variation

1.) A.) $C = (\text{cost of top + bottom}) + (\text{Cost of side})$

$$= \underbrace{(2\pi r^2 \text{ cm}^2)}_{\text{Total area of top + bottom}} \underbrace{\left(\frac{0.05¢}{\text{cm}^2}\right)}_{\text{cost/unit Area}} + \underbrace{(2\pi r h \text{ cm}^2)}_{\text{Total area of side of can}} \underbrace{\left(\frac{0.02¢}{\text{cm}^2}\right)}_{\text{cost/unit Area}}$$

$$= \underline{0.10\pi r^2 + 0.04\pi r h}$$

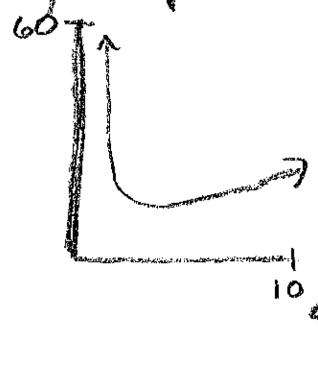
- Since we have to express cost in terms of r, we need to use the volume of a cylinder formula, sub in 500 and solve for h.
- Then sub the h equation in for h in the equation above, then simplify.

$$V = \pi r^2 h \rightarrow 500 = \pi r^2 h \rightarrow \frac{500}{\pi r^2} = h$$

$$C(r) = 0.10\pi r^2 + 0.04\pi r\left[\frac{500}{\pi r^2}\right]$$

$$\boxed{C(r) = 0.10\pi r^2 + \frac{20}{r} \quad \text{or} \quad \frac{0.10\pi r^3 + 20}{r}}$$

B.) Graph C(r) of calculator



C.) use Min function on calc to get (3.17, 9.47)

$\boxed{r = 3.17 \text{ cm}}$

d.) $\boxed{\text{least cost} \approx 9.47¢}$

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2.) A.) Because W varies inversely with L, we Know that $W = \frac{K}{L}$

- Sub in 500 for W + 10 For L, AND solve For K. Then sub in For K in the equation above.

$$500 = \frac{K}{10} \rightarrow 10 \cdot 500 = \frac{K}{\cancel{10}} \cdot \cancel{10}$$

$$5000 = K$$

$$\rightarrow \boxed{W(L) = \frac{5000}{L}}$$

B.) To Find the max weight, sub 25 in For L AND solve For W

$$W(25) = \frac{5000}{25} \rightarrow \boxed{W = 200 \text{ lbs}}$$

3.) L = heat loss, T = temp. Difference, A = Area of wall, d = thickness of wall

$$\boxed{L = K \cdot \frac{AT}{d}}$$ where K is the constant of proportionality

4.) $F = K \cdot Av^2 \rightarrow$ Since F varies jointly w/ A AND v^2

$$150 = K \cdot (4 \cdot 5)(30)^2 \rightarrow K = \frac{1}{120}$$

$F = \frac{1}{120} Av^2 \rightarrow$ Sub $(3 \cdot 4)$ in for A AND 50mph for v $\rightarrow F = \frac{1}{120}(3 \cdot 4)(50)^2 = \boxed{250 \text{ lbs}}$