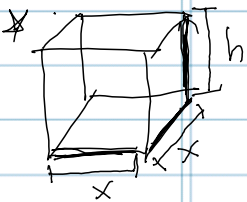


Optimization

A manufacturer wants to design an open box having a square base and a surface area of 108 square inches. What dimensions will produce a box of maximum volume?



$$V = x^2 h \text{ - primary equation}$$

$$SA = (\text{area of base}) + (\text{area of sides})$$

$$SA = x^2 + 4xh = 108 \text{ - secondary}$$

$$h = \frac{(108 - x^2)}{4x}$$

$$V = x^2 h$$

$$= x^2 \left(\frac{108 - x^2}{4x} \right) = \underline{\underline{27x - \frac{x^3}{4}}}$$

$$\frac{dV}{dx} = 27 - \frac{3x^2}{4} = 0$$

$$3x^2 = 108$$

$$x = \sqrt{\frac{108}{3}} = \underline{\underline{6}}$$

$$V = (6)^2 h \quad h = \frac{(108 - (6)^2)}{4(6)} = 3$$

$$\boxed{6 \times 6 \times 3 \text{ in}}$$