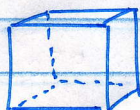


- ③ Suppose an airline policy states that all baggage must be for shaped with a sum of length, width and height not exceeding 108 in. what are the dimensions and volume of a square shaped box with are greatest volume under these condition?

Ans



Constraint $x+x+y = 108$

Volume $= x^2 \cdot y \text{ in}^3$ | Goal: maximize volume

$$V(x) = x^2 (108 - 2x) = 108x^2 - 2x^3$$

$$V'(x) = 216x - 6x^2 = 6(36x - x^2) = 6x(36 - x)$$

$$V'(x) = 0 \Rightarrow x = 0 \text{ or } x = 36 ; x = 0 \text{ not feasible hence } x = 36$$

$$y = 108 - 72$$

$$= 36 //$$

Also $x \leq 54$ $V''(x) = 216 - 12x$; $V''(36) = 216 - 12(36) = 216 - 432 = -216 < 0$

By SDT $\Rightarrow V(x)$ local maximum at $x = 36$

Consider $[0, 54]$, $V(0) = 0$, $V(54) = 0$ | Hence $V(36)$ is an absolute maximum
 $x(\text{in})$

\therefore dimension are $(30, 36, 36)$