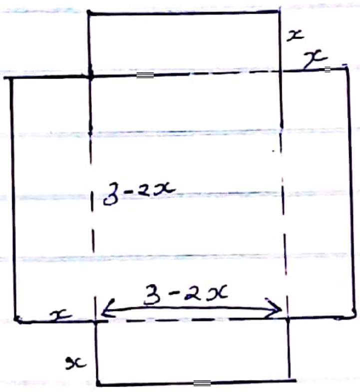
1



Volume : $(3-2x)(3-2x)x$

$= (4x^2 - 12x + 9)x$

$= 4x^3 - 12x^2 + 9x$

$$\frac{dV}{dx} = 12x^2 - 24x + 9$$

For the largest volume, $\frac{dV}{dx} = 0$

$12x^2 - 24x + 9 = 0$

solving quadratically, $x = \frac{3}{2}$, $x = \frac{1}{2}$

$$\frac{d^2V}{dx^2} = 24x - 24$$

$\frac{d^2V}{dx^2}\left(\frac{1}{2}\right) = -12, < 0$, $\frac{d^2V}{dx^2}\left(3/2\right) = 12, > 0$

Thus Volume is maximum when $x = 1/2$
Volume is minimum when $x = 3/2$

$[1/2, 3/2]$

2. $f(x) = 2^x$

(a) $f(5) = 2^5$

$= 32$

(b) $f(-4) = 2^{-4} = \frac{1}{2^4}$

$= \frac{1}{16}$ or 0.0625

(c) $\lim_{x \to \infty} f(x)$

$= 2^{\infty} = \infty$

(d) $\lim_{x \to -\infty} f(x) = \frac{1}{2^{\infty}} = \frac{1}{\infty}$

$= 0$