Question 7:

a) When $y = 0 \Rightarrow x^2 = 16 \Rightarrow x = \pm 4 \therefore x = 4$ (first quad)

$V = \pi \int_0^4 y^2 = 8 - \frac{x^2}{2}$

$\Rightarrow y$

$\Rightarrow V = \pi \int_0^4 y^2 \, dx = \pi \int_0^4 \left[8 - \frac{x^2}{2}\right] dx$

$\Rightarrow V = \left[8x - \frac{x^3}{6}\right]_0^4 = \left(32 - \frac{64}{6}\right) - 0.$

$= \frac{192 - 64}{6} = \frac{128}{6} = 21\frac{1}{3} \ (\text{unit}^3)$

b)

i) $P_{(\text{second attempt})} = 0.75 \times 0.75 = 0.5625.$

ii) $P_{\left(\begin{array}{c}\text{not connected} \\ \text{on third attempt}\end{array}\right)} = (0.25)^3 = 0.015625.$

c)

$x = \frac{t - 2}{t + 2}$

i) When $t = 0 \Rightarrow x = -1,$

it means the particle is 1 m to the left.

ii) $x = \dfrac{t-2}{t+2}$

$\Rightarrow x = \dfrac{t+2-4}{t+2} = 1 - \dfrac{4}{t+2}.$

$\therefore v = \dot{x} = (-1) \times (-4) \times (t+2)^{-2} = \dfrac{4}{(t+2)^2}$

and: $a = \dot{v} = (-2) \times 4 \times (t+2)^{-3} = \dfrac{-8}{(t+2)^3}.$

iii). when $v = 0$.

$\Rightarrow \dfrac{4}{(t+2)^2} = 0.$

$\therefore (t+2)^2 = 0.$

$\Rightarrow t = -2$ (time never negative).

Therefore the particle never rest.

iv). $v = \dfrac{4}{(t+2)^2}$

$\lim\limits_{t \to \infty} \dfrac{4}{(t+2)^2} = 0.$

as t increases indefinitely, velocity will come to 0.