

7) $\frac{x^2}{2} + y^2 = 8$
 $\pi \int_0^4 \left(\frac{x^2}{2} + y^2 - 8 \right)^2 dx$
 ~~$\left[\frac{x^3}{3} + \frac{y^3}{3} - 8x \right]_0^4$~~

$\left(\frac{x^2}{2} + y^2 - 8 \right) \left(\frac{x^2}{2} + y^2 - 8 \right)$
 $\left(\frac{x^2}{2} \right)^2 + 2y^2 \frac{x^2}{2} - \frac{16x^2}{2} + y^4 - 16y^2 + 64$
 $\pi \times \int_0^4 \left(\frac{x^4}{2} + 2y^2 \left(\frac{x^2}{2} \right) - \frac{16x^2}{2} + y^4 - 16y^2 + 64 \right) dx$
 $\pi \times \left[\frac{x^5}{2} + \frac{2y^2 \left(\frac{x^3}{2} \right) - \frac{16x^3}{2} + \frac{y^5}{5} - \frac{16y^3}{3} + \frac{64x}{2} \right]_0^4$

Volume =

7) a) $\frac{x^2}{2} + y^2 = 8$
 $\frac{x^2}{2} - 8 = -y$
 $y = -\frac{x^2}{2} + 8$

Volume = $\pi \times \int_0^4 \left(-\frac{x^2}{2} + 8 \right)^2 dx$
 $= \pi \times \left[\left(-\frac{x^2}{2} \right)^2 + \frac{-8x^2}{2} + \frac{-8x^2}{2} + 64 \right]_0^4$
 $= \pi \times \left[\frac{\left(-x^2 \right)^2}{3} + \frac{\left(-16x^2 \right)^2}{2} + \frac{64^2}{2} \right]_0^4$

\therefore Volume = 69.75 units²



$$\begin{aligned} \text{b) i)} &= 0.75 \times 0.75 \\ &= 0.5625 \left(\frac{9}{16}\right) \end{aligned}$$

$$\begin{aligned} \text{ii)} &= 0.25 \times 0.25 \times 0.25 \\ &= 0.015625 \left(\frac{1}{64}\right) \end{aligned}$$

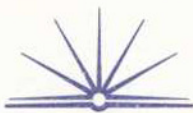
$$\begin{aligned} \text{c) i)} &= \frac{-2}{2} \\ &= -1 \end{aligned}$$

$$\begin{aligned} \text{ii) let } t &= 9 \\ x &= \frac{9-2}{9+2} \\ &= \frac{7}{11} \end{aligned}$$

$$\begin{aligned} x &= 1 - \frac{4}{9+2} \\ &= 1 - \frac{4}{11} \\ &= \frac{7}{11} \end{aligned}$$

$$\begin{aligned} x(t+2) &= 1-4 \\ t+2 &= \frac{1-4}{x} \\ t &= \frac{-3}{x} - 2 \end{aligned}$$

iii) no, the particle is gradually accelerating as 't' increases.



(v) limiting sum of a geometric series = ~~1~~ $\frac{a}{1-r}$

$$\therefore \text{limiting velocity} = \frac{-1}{1-3}$$

$$= \frac{1}{2}$$

\therefore the limiting velocity = $\frac{1}{2}$ as $t \rightarrow \infty$