(a) ~~[illegible]~~ $\frac{x^2}{2} + y^2 = 8$

When $y = 0$

$\frac{x^2}{2} + 0 = 8$

$x^2 = 16$

$\therefore x = \pm\sqrt{16}$

$= \pm 4$

But we can see that it lies in the first quadrant,

$\therefore x = 4$

$\therefore V = \pi \int_0^4 y^2 \, dx$

$\frac{x^2}{2} + y^2 = 8$

$\therefore y^2 = 8 - \frac{x^2}{2}$

$\therefore V = \pi \int_0^4 (8 - \frac{x^2}{2}) \, dx$

~~[illegible]~~

$= \pi \left[8x - \frac{x^3}{6} \right]_0^4$

$= \pi \left[8(4) - \frac{4^3}{6} - (8(0) - \frac{0^3}{6}) \right]$

$= \pi \left[32 - \frac{32}{3} \right]$

$= \frac{64}{3} \pi$ square units

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(b) (i) P(connecting 2nd time) = ~~[crossed out]~~

$= P(\tilde{E}E)$

$= 0.25 \times 0.75$

$= 0.1875$ or $\frac{3}{16}$

(ii) P(not connected) $= P(\tilde{E}\tilde{E}\tilde{E})$

$= 0.25 \times 0.25 \times 0.25$

$= 0.015625$ or $\frac{1}{64}$

(c) (i) When $t = 0$

$x = \frac{0-2}{0+2}$

$= -1$

$\therefore$ Displacement when $t = 0$ is -1 metres.

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

~~[crossed out]~~ Also, $x = 1 - \frac{4}{t+2}$

Solving simutaneously

$\therefore 1 - \frac{4}{t+2} = \frac{t-2}{t+2}$

$1 = \frac{t-2}{t+2} + \frac{4}{t+2}$

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$\therefore 1 = \frac{t-2+4}{t+2}$

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

$= 1$

$= LHS$

$\therefore x = 1 - \frac{4}{t+2}$

$\therefore V = \frac{dx}{dt}$

$= \frac{-4}{(t+2)^2}$

$\therefore A = \frac{dV}{dt}$

$= \frac{8}{(t+2)^3}$

(iii) Particle is at rest when $V=0$

$\therefore \frac{-4}{(t+2)^2} = 0$

$\therefore t = 0$

$\therefore$ particle is at rest only when $t=0$

(iv) The velocity is decreasing as t increases indefinately, and it is slowly approaching 0.

$\therefore$ Limiting Velocity $= 0$