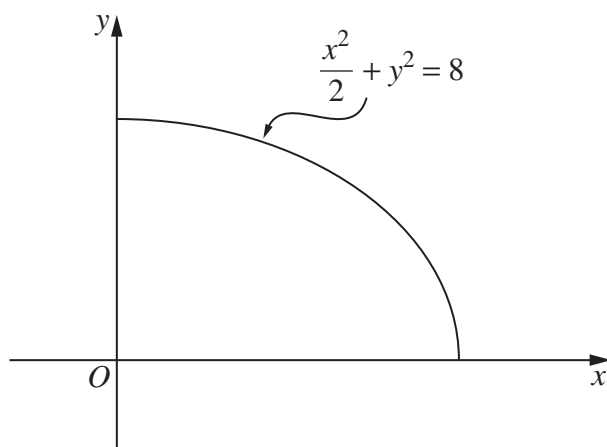**Question 7** (12 marks) Use a SEPARATE writing booklet.

(a)

The part of the curve $\dfrac{x^2}{2} + y^2 = 8$ that lies in the first quadrant is rotated about the x axis.

Find the volume of the solid of revolution.

(b) Onslo tries to connect to his internet service provider. The probability that he connects on any single attempt is 0.75.

    (i) What is the probability that he connects for the first time on his second attempt? **2**

    (ii) What is the probability that he is still not connected after his third attempt? **1**

(c) A particle moves in a straight line so that its displacement, in metres, is given by

$$x = \frac{t-2}{t+2} \quad \text{where } t \text{ is measured in seconds.}$$

    (i) What is the displacement when $t = 0$? **1**

    (ii) Show that $x = 1 - \dfrac{4}{t+2}$. **3**

    Hence find expressions for the velocity and the acceleration in terms of t.

    (iii) Is the particle ever at rest? Give reasons for your answer. **1**

    (iv) What is the limiting velocity of the particle as t increases indefinitely? **1**