

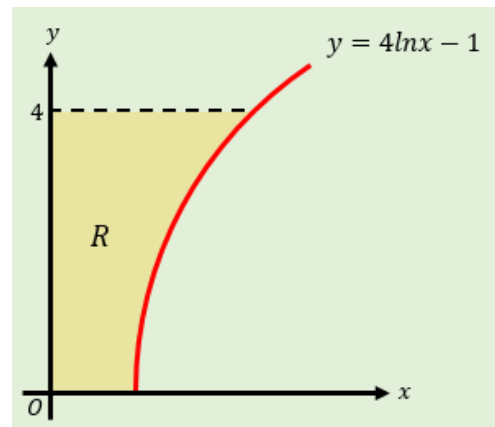
## 4A/B Volumes of Revolution

A Reminder from CP1:

1. The region  $R$  is bounded by the curve with equation  $y = \sin 2x$ , the  $x$ -axis and the lines  $x = 0$  and  $x = \frac{\pi}{2}$ .

Find the volume of the solid formed when region  $R$  is rotated through  $2\pi$  radians about the  $x$ -axis.

2. The diagram shows the curve with equation  $y = 4\ln x - 1$ .



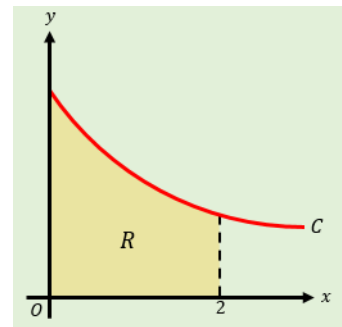
## 4C Revolutions with Parametrics

1. The curve  $C$  shown has parametric equations:

$$x = t(1 + t), \quad y = \frac{1}{1 + t}, \quad t \geq 0$$

The region  $R$  is bounded by the curve, the x-axis and the lines  $x = 0$  and  $x = 2$ .

Find the exact volume of the solid formed when  $R$  is rotated  $2\pi$  radians about the x-axis.





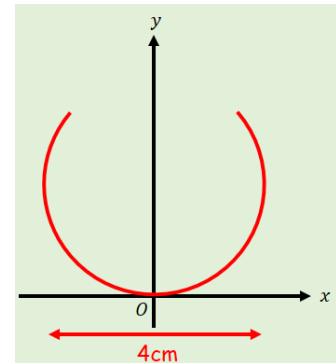
## 4D Modelling with Volumes of Revolution

1. The diagram shows a model of a goldfish bowl. The cross section of the bowl is described by the curve with parametric equations:

$$x = 2\sin t, \quad y = 2\cos t + 2, \quad \frac{\pi}{6} \leq t \leq \frac{11\pi}{6}$$

Where the units of  $x$  and  $y$  are in cm. The bowl is formed by rotating this curve about the  $y$ -axis to form a solid of revolution.

- a) Find the volume of water required to fill the model to a height of 3cm.



- b) The real bowl has a diameter of 48cm. Find the volume of water needed to fill it to the corresponding height