Modelling with Volumes of Revolution

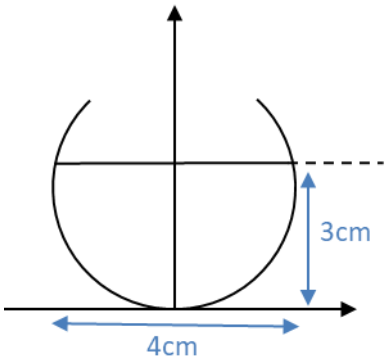
Example

The diagram shows a model of a goldfish bowl. The cross-section of the model is described by the curve with parametric equations
$x = 2\sin t\,,\ y = 2\cos t + 2, \frac{\pi}{6} \leq t \leq \frac{11\pi}{6}$, where the units of x and y are in cm. The goldfish 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.

The real goldfish bowl has a maximum diameter of 48cm.

(b) Find the volume of water required to fill the real goldfish bowl to the corresponding height.



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