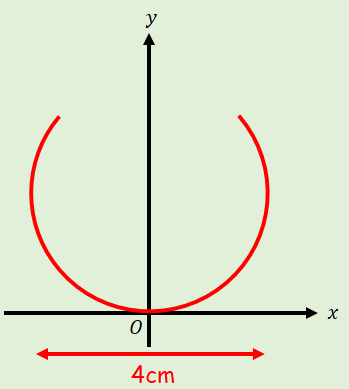
**4D Modelling with Volumes of Revolution**

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

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

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



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