

## Section 1: Volumes of revolution

### Crucial points

1. **Don't forget the 'π' in the volume of revolution formula**

Remember the formulae are  $V = \int_a^b \pi y^2 dx$  and  $V = \int_c^d \pi x^2 dy$ .

2. **Make sure that you use the correct limits of integration**

Remember that if you are rotating about the  $x$ -axis, the limits of integration must be  $x$ -coordinates, and if you are rotating about the  $y$ -axis, the limits of integration must be  $y$ -coordinates.

3. **Remember to integrate with respect to the correct variable**

You need to substitute for  $x^2$  or  $y^2$  to do this.

Example Find the volume of revolution of  $y = x^2$  about the  $x$ -axis between  $x = 1$  and  $x = 2$ .

✗ **Wrong**  $V = \int_0^1 \pi y^2 dx = \pi \left[ \frac{1}{3} y^3 \right]_0^1 = \frac{1}{3} \pi$

✓ **Right**  $V = \int_0^1 \pi y^2 dx = \int_0^1 \pi x^4 dx = \pi \left[ \frac{1}{5} x^5 \right]_0^1 = \frac{1}{5} \pi$