Section 1: Further volumes of revolution

Crucial points

1. **Don't forget the 'π' in the volume of revolution formula**
   Remember the formulae are $V = \int_a^b \pi y^2 \mathrm{d}x$ and $V = \int_c^d \pi x^2 \mathrm{d}y$.

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*** $V = \int_0^1 \pi y^2 \mathrm{d}x = \pi \left[\frac{1}{3} y^3\right]_0^1 = \frac{1}{3}\pi$

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