

5.4) Modelling with volumes of revolution

Worked example

A manufacturer wants to cast a prototype for a new design for a lightbulb out of glass. A region is used as a model for the cross-section of the lightbulb. The region is bounded by the x -axis and the curve with equation $y = k - 60x^2$, and will be rotated around the y -axis. Each unit on the coordinate axes represents 1cm.

- Suggest a suitable value for k .
- Use your value of k to estimate the volume of glass needed to make the prototype.
- State one limitation of this model.

Your turn

A manufacturer wants to cast a prototype for a new design for a pen barrel out of solid resin. A region is used as a model for the cross-section of the pen barrel. The region is bounded by the x -axis and the curve with equation $y = k - 100x^2$, and will be rotated around the y -axis. Each unit on the coordinate axes represents 1cm.

- Suggest a suitable value for k .
- Use your value of k to estimate the volume of resin needed to make the prototype.
- State one limitation of this model.

(a) $k = 10$ ($10 \leq k \leq 15$ sensible)

(b) 1.57cm^3 (3 sf)

(c) The cross-section of the pen unlikely to match the curve exactly

Worked example

Use integration to show that the volume of a cylinder is $V = \pi r^2 h$

Use integration to show that the volume of a sphere is $V = \frac{4}{3}\pi r^3$

Your turn

Use integration to show that the volume of a cone is $V = \frac{1}{3}\pi r^2 h$

Shown