Chapter notes: 20 Further applications of calculus

Overview

This chapter applies the methods from chapters 16–19. It needs approximately eight hours of teaching time.

Introductory problem

This problem is an example of a real-world modelling situation. You might like students to think about the following question: If the radius is growing at a constant rate, will the area also be growing at a constant rate? There is also an opportunity to ask students to consider the types of modelling assumptions that might be used in this situation, and how valid they might be. The worked solution is given at the end of the chapter, page 681; the idea being that students should be able to answer the question using the methods covered in the chapter.

20A Related rates of change, p659

Hints for grade 7 questions:

8. Use Pythagoras to work out the distance in terms of displacement east and north.

20B Kinematics, p663

It is particularly important that students remember the constant of integration when dealing with kinematics questions.

20C Volumes of revolution, p668

The formula for surfaces of revolution around the x-axis, as mentioned in the 'Research explorer' box on page 671, is:

$$2\pi \int y \sqrt{1+\left(\frac{\mathrm{d}y}{\mathrm{d}x}\right)^2}\,\mathrm{d}x$$

It might be useful to get students to derive this using similar ideas to those from Fill-in proof sheet 23.

20D Optimisation with constraints, p674

Hints for grade 7 questions:

10. Use the volume to eliminate h.

11. (b) It is sufficient to show that $b = \frac{20}{3}$.

13. The distance is given by $\sqrt{(y-4)^2+(x-0)^2}$, but you might like to minimise the distance squared.