

## PAST YEARS EXAMINATION QUESTIONS

- 1 The radius  $r$  of a circle is increasing *at the rate* of 0.02 cm/s. Find the rate at which the area is increasing when the radius is 3 cm, giving your answer in terms of  $\pi$ .

N2002/I/10(b) (AO Maths)

- 2 Given that  $y = \frac{\ln x}{2x + 3}$ , find

(i)  $\frac{dy}{dx}$ ,

- (ii) the rate of change of  $x$  at the instant when  $x = 1$ , given that  $y$  is changing at the rate of 0.12 units per second at this instant. [2]

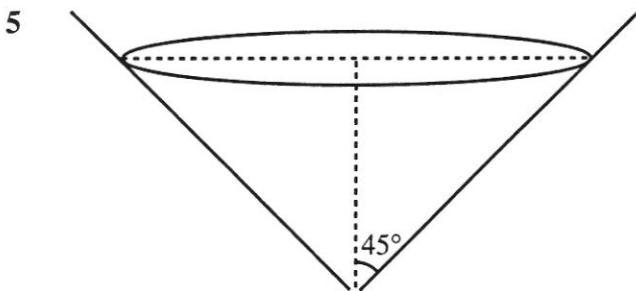
N2003/I/8 (part)

- 3 The side,  $x$  cm, of a cube is increasing at a constant rate of 0.4 cm/s. Find the rate of increase of the volume of the cube when  $x = 2$ .

N2003/I/14(c) (AO Maths)

- 4 A spherical balloon has volume  $V$  cm<sup>3</sup> where  $V = \frac{4}{3}\pi r^3$  and  $r$  cm is the radius of the balloon. When the balloon is released it rises and expands. Given that the rate of increase of the radius is constant at 0.002 cm/s, find in terms of  $\pi$ , the rate of increase of  $V$  when  $r = 15$ .

N2004/II/1 (AO Maths)



A hollow cone of semi-vertical angle  $45^\circ$  is held with its vertical and vertex downwards (see diagram). At the beginning of an experiment, it is filled with 390 cm<sup>3</sup> of liquid. The liquid runs out through a small hole at the vertex at a constant rate of 3 cm<sup>3</sup>/s. Find the rate at which the depth of the liquid is decreasing 3 minutes after the start of the experiment.

N2006/I/7 (Maths C)

- 6 A curve has the equation  $y = (2x - 1)\sqrt{4x + 1}$ .

- (i) Express  $\frac{dy}{dx}$  in the form  $\frac{kx}{\sqrt{4x + 1}}$ , where  $k$  is a constant. [4]

Hence

- (ii) find the rate of change of  $x$  when  $x = 2$ , given that  $y$  is changing at a constant rate of 2 units per second, [2]

- (iii) evaluate  $\int_0^2 \frac{3x}{\sqrt{4x + 1}} dx$ . [3]

N2009/I/12