
Differentiation: Connected Rates of Change 2 - Edexcel Past Exam Questions

1.

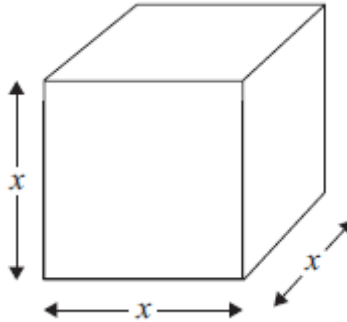
**Figure 1**

Figure 1 shows a metal cube which is expanding uniformly as it is heated.

At time t seconds, the length of each edge of the cube is x cm, and the volume of the cube is V cm³.

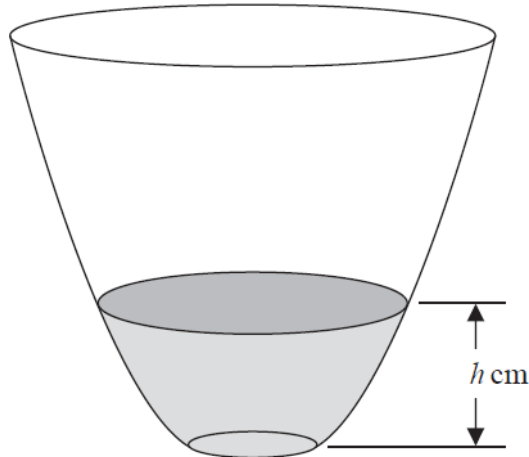
(a) Show that $\frac{dV}{dx} = 3x^2$. (1)

Given that the volume, V cm³, increases at a constant rate of 0.048 cm³ s⁻¹,

(b) find $\frac{dx}{dt}$ when $x = 8$, (2)

(c) find the rate of increase of the total surface area of the cube, in cm² s⁻¹, when $x = 8$. (3)
June 12 Q2

2.


Figure 2

A vase with a circular cross-section is shown in Figure 2. Water is flowing into the vase.

When the depth of the water is h cm, the volume of water V cm³ is given by

$$V = 4\pi h(h + 4), \quad 0 \leq h \leq 25$$

Water flows into the vase at a constant rate of 80π cm³ s⁻¹.

Find the rate of change of the depth of the water, in cm s⁻¹, when $h = 6$.

(5)
June 14 Q4

3. At time t seconds the radius of a sphere is r cm, its volume is V cm³ and its surface area is S cm².

[You are given that $V = \frac{4}{3}\pi r^3$ and that $S = 4\pi r^2$]

The volume of the sphere is increasing uniformly at a constant rate of 3 cm³ s⁻¹.

- (a) Find $\frac{dr}{dt}$ when the radius of the sphere is 4 cm, giving your answer to 3 significant figures.

(4)

- (b) Find the rate at which the surface area of the sphere is increasing when the radius is 4 cm.

(2)
June 14(R) Q5