1 Differentiate $x + \sqrt{x^3}$. [4]

2 The gradient of a curve is given by $\frac{dy}{dx} = \frac{6}{x^3}$. The curve passes through $(1, 4)$.

Find the equation of the curve. [5]

3 A and B are points on the curve $y = 4\sqrt{x}$. Point A has coordinates (9, 12) and point B has x-coordinate 9.5. Find the gradient of the chord AB.

The gradient of AB is an approximation to the gradient of the curve at A. State the x-coordinate of a point C on the curve such that the gradient of AC is a closer approximation. **[3]**

4 Differentiate $2x^3 + 9x^2 - 24x$. Hence find the set of values of x for which the function $f(x) = 2x^3 + 9x^2 - 24x$ is increasing. **[4]**

5 Find the set of values of x for which $x^2 - 7x$ is a decreasing function. **[3]**

6 Differentiate $10x^4 + 12$. [2]

7

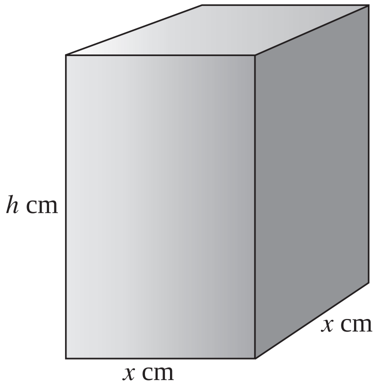

Fig. 10

Fig. 10 shows a solid cuboid with square base of side x cm and height h cm. Its volume is 120 cm^3.

(i) Find h in terms of x. Hence show that the surface area, $A\,\text{cm}^2$, of the cuboid is given by $A = 2x^2 + \dfrac{480}{x}$. [3]

(ii) Find $\dfrac{dA}{dx}$ and $\dfrac{d^2A}{dx^2}$. [4]

(iii) Hence find the value of x which gives the minimum surface area. Find also the value of the surface area in this case. [5]

8 Differentiate $6x^{\frac{5}{2}} + 4$. [2]

9 A is the point $(2, 1)$ on the curve $y = \dfrac{4}{x^2}$.

B is the point on the same curve with x-coordinate 2.1.

(i) Calculate the gradient of the chord AB of the curve. Give your answer correct to 2 decimal places. [2]

(ii) Give the x-coordinate of a point C on the curve for which the gradient of chord AC is a better approximation to the gradient of the curve at A. [1]

(iii) Use calculus to find the gradient of the curve at A. [2]

10 The gradient of a curve is given by $\frac{dy}{dx} = x^2 - 6x$. Find the set of values of x for which y is an increasing function of x. [3]

11 A curve has gradient given by $\frac{dy}{dx} = 6x^2 + 8x$. The curve passes through the point $(1, 5)$. Find the equation of the curve. [4]