

Please attempt the following questions in preparation for the online session on 11<sup>th</sup> January.

Q1

A function  $f$  is defined on a suitable domain by  $f(x) = \sqrt{x} \left( 3x - \frac{2}{x\sqrt{x}} \right)$

(a) Find  $f'(x)$ .

(b) Hence or otherwise calculate  $f'(4)$ .

Q2

Given that  $y = 8x^4 + 6\sqrt[3]{x}$ , where  $x > 0$ , find  $\frac{dy}{dx}$ .

Q3

(a) Find the coordinates of the stationary points on the graph with equation  $y = f(x)$ , where  $f(x) = x^3 + 3x^2 - 24x$ .

(b) Hence determine the range of values of  $x$  for which the function  $f$  is strictly decreasing.

Q4

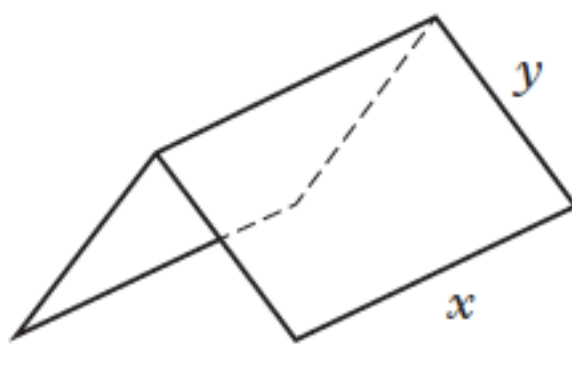
Find the maximum and minimum values

of the function  $f(x) = x^3 - 6x^2 + 9x$  in the interval  $-2 \leq x \leq 5$ .

Q5

A manufacturer makes open ended shelters.

The frame is made from metal rods as shown in the diagram.



The length of the rods for the top and bottom edges are  $x$  metres and the length of the sloping edges are  $y$  metres.

The frame is to be covered by a rectangular sheet of material with a total area of  $24 \text{ m}^2$ .

(a) Show that the total length,  $L$  metres, of the rods used in a shelter is given by

$$L = 3x + \frac{48}{x}$$

(b) Find the value of  $x$  for which  $L$  is a minimum.