DIFFERENTIATION II   SET 1

1   For what values of x is $f(x) = 2x^3 - 3x^2 - 36x + 24$

   (a) stationary,

   (b) decreasing?

2   Calculate the rate of change of $h(t) = 3t^2 - 4t$ when $t = 3$.

3   A function f is defined by the formula $f(x) = (x-1)^2(x+2)$, where $x \in R$.

   (a) Find the coordinates of the point where the curve with equation $y = f(x)$ crosses the x - and y-axes

   (b) Find the stationary points of this curve and determine their nature.

   (c) Sketch the curve $y = f(x)$.

4   If $v = \dfrac{u}{6} - \dfrac{6}{u}$, find $\dfrac{dv}{du}$.

5   A rectangular box without a lid is made from 150cm^2 of metal.

   Its base measures x cm by $2x$ cm.

   (a) Find the height of the box in terms of x and hence show that the volume V cm^3 is given by $V = 50x - \dfrac{2}{3}x^3$.

   (b) Find the maximum volume of the box and state its dimensions.