# **Formal Exercise 9 Differentiation (2)**

1. Differentiate the following with respect to x:

 i) $\frac{-4}{x-2}$ ii) cos(3 – 2x) iii) 5sin²x (2,3,2)

2. Given that f(x) = $\sqrt{3x^{2}-2}$, find f’(2) (4)

3. If f(a) = cos(2a) – 3sin(4a), find the exact value of f’$\left(\frac{π}{6}\right)$ (6)

4. Show that f(x) = $\frac{x^{3}}{3}$ + x² + x + 4 is never decreasing (3)

5. For what values of x is the function f(x) = $\frac{1}{3}$x³ - 2x² - 5x – 4 increasing? (5)

6. The displacement x millimetres of a point at time t seconds is expressed as

 x = t³ + t² - 6

 Calculate a) its displacement after 4 seconds (1)

 b) Its velocity and acceleration at t = 2 (4)

7. Given that y = 2x² + x, find $\frac{∂y}{∂x}$ and hence show that x$\left(1+ \frac{∂y}{∂x}\right)$ = 2y (4)

8. An open cistern with a square base and vertical sides is to have a capacity of 4000 cubic feet.

1. Taking the length of the square base to be x feet,

Find an expression for the height *h* in terms of *x* (1)

h

1. Hence show that the surface area, A square feet,

of the cistern can be written in the form (3)

x

 A(x) = x² + $\frac{1600}{x}$

x

1. Find the dimensions of the cistern so that the cost of cladding it in lead sheet

will be minimized (6)

**44 MARKS**