Differentiation

1. Differentiate the following:

a)
$$f(x) = x(x^2 + 2x)$$

b) $y = \frac{x^5 - 1}{x^2}$
c) $f(x) = \frac{x^2 - 3}{x^4}$
d) $y = 3x_3^2 - \frac{5}{x_2^3}$

- 2. Find the rate of change for the function, $f(x) = 2x^3 + x^2 \frac{3}{2}x + 4$, when x = 2.
- 3. Find the equation of the tangent to the curve $y = x^3 2x^2 + 4$ at the point where x = 2.
- 4. Find the equation of the tangent to $y = x^2 + 3x + 2$ parallel to the line y = 2x + 1.
- 5. Find the stationary point(s) of the curve $y = 8x^3 4x^2 + 6$ and determine their nature.
- 6. An open tank is to be designed in the shape of a cuboid with a square base, the total surface area of the base and four walls together being $100m^2$.
 - a) If the length of the base is x cm, show that the volume,

V(x) is given by V(x) =
$$\frac{x}{4}(100 - x^2)$$
.

b) Find the length of the base that makes the volume of the tank a maximum.