# ECO137 HW Questions for Chapter 6 "Differentiation"

1.(a) Let $f(x) = 3x2 + 2x - 1$. Show that for $h \neq 0$,

$$\frac{f(x + h) - f(x)}{h} = 6x + 2 + 3h$$

Use this result to find f'(x).

(b) Find in particular f'(0), f'(-2), and f'(3). Find also the equation of the tangent to the graph at the point (0,-1).

2. Examine where $f(x) = -x^3 + 4x^2 - x - 6$ is increasing/decreasing.

3. The profit function is $\pi(Q)=24Q - Q^2 - 5$. Find the marginal profit, and find the value Q* of Q which maximizes profits.

4. For $f(x) = (x^4-6x^2)$, determine the intervals where f is increasing.

5. For $f(x) = 3x/(-x^2+4x-1)$, compute f'(x) and determine where the function increase by using a sign diagram. (The function is not defined for $x = 2\pm\sqrt{3}$).

6. If f is differentiable at x, find the expressions for the derivatives for the following functions.

(a) $x^2f(x)+[f(x)]^3$    (b) $[f(x)]^2/x^3$.

7. Find the intervals where the following functions are increasing:

(a) $y = x^3 + e^2x$       (b) $y = 5x^2e^{-4x}$

8. Find the derivatives of

(a) $y = x^3(lnx)^2$   (b) $y = (lnx + 3x)^2$

9. Find the intervals where the following functions are increasing:

(a) $y = ln(4-x^2)$  (b) $y = (1-lnx)^2/(2x)$