Sheet (1) Operations Research

1) Find the critical points of *f and determine if its local minimum or local maximum*

1. $f(x) = 4x^3 + 12x^2 + 12x + 10.$
2. $f(x) = 2x^3 - 21x^2 + 36x - 15$
3. $y = -3x^2 - 6x - 4$
4. $y = 3x^4 + 4x^3 - 12x^2 + 12$

2) Determine the values of constants a, b, c, and d so that $f(x) = ax^3 + bx^2 + cx + d$ has a local maximum at the point $(0, 0)$ and a local minimum at the point $(1, -1)$.

since a point is a local max or min, the point lies on the curve
substituting with x & y will give us the value of some variables

3) A stone is thrown in the air. Its height at any time t is given by

$$h = -5t^2 + 10t + 4.$$

1. find the max height
2. find the time needed to reach the max point

4) Suppose the derivative of the function $y = f(x)$ is

$$y' = (x - 1)^2(x - 2)(x - 4).$$

At what points, if any, does the graph of *f* have a local minimum, local maximum, or point of inflection?

5) The sum of two positive numbers is 16. What is the smallest possible value of the sum of their squares?