## Quiz

<u>Problem 1(3 points)</u>: Consider the following function:

$$F(x) = 100(x_2 - x_1^2)^2 + (1 - x_1)^2$$
(1)

- 1. Determine, by hand calculations, the stationary point for this function. Is this a minimum, a maximum or a saddle point?
- 2. Determine the minimum for the above function when the following *inequality constraint* is enforced:

$$x_1 \ge 2 \tag{2}$$

<u>Problem 2</u> (2 points):

To determine the extremum for the function:

$$F(x) = x_1^4 - 2x_2x_1^2 + x_2^2 + x_1^2 - 2x_1 + 5$$
(3)

it is necessary to solve the following equations *simultaneously*:

$$\begin{array}{rcl}
4x_1^3 - 4x_2x_1 + 2x_1 - 2 &= 0 \\
-2x_1^2 + 2x_2 &= 0
\end{array}$$
(4)

Starting from  $x_1 = 1$  and  $x_2 = 2$ , do one iteration of Newton's method.

Newton's Method Formula:

$$\begin{array}{rcl} x^{k+1} &=& x^k - [J]^{-1}f(x^k) \\ where & J &=& \displaystyle \frac{\partial f}{\partial x}|_{x=x^k} \end{array}$$