Homework 2
OPER 527

Name _____

Be sure to show all work.

Below any figure or answer calculated in R or MATLAB, put the code below the calculation or figure.

If a problem says "By Hand" then you should show your handwritten work.

1. Consider the following function (the same as in problem 1):

$$f(x) = (sin(x) + 1)\, e^{10x - x^2 - 25}, \quad 0 < x < 10$$

   (a) (5 pts) Plot $f(x)$ in MATLAB. (Be sure to put code below/above the figure).

   (b) (5 pts) What would be a good starting value x_0 for the Gauss-Newton method and why?

   (c) (10 pts) Find $f'(x) = \frac{df(x)}{dx}$ and $f''(x) = \frac{d^2 f(x)}{dx^2}$ (by hand) and use MATLAB to plot both along with $f(x)$ on the same graph.

   (d) (15 pts) Use the Gauss-Newton method to approximate to at least four decimal places the maximizer x^* and the maximum $f(x^*)$.

   (e) (5 pts) How many iterations did it take to find the maximum? '

2. Consider the following linear function:

$$f(x) = 15 + \cos\left(\frac{13}{7}\right) x$$

   .

   (a) (5 pts) Use MATLAB to plot this function.

   (b) (10 pts) Suppose we are subject to the following constraints:

$$3cos(3x) \geq 1 \tag{1}$$
$$12 - x \geq 0 \tag{2}$$
$$x \geq 0 \tag{3}$$

   What is the feasible region?

   (c) (5 pts) What is maximizer x^* and $f(x^*)$ such that the constraints are held?

   (d) (5 pts) What is the minimizer z^* and $f(z^*)$ such that the constraints are held?