1. Write the gradient descent optimization code for minimizing the following functions and find the values of x for which f(x) is minimum.

a. f(x) = x2

b.f(x)=(x+1)2  
c. f(x1 , x2) = x12 + x22

2.Check the convexity of above functions between the arbitrary interval [a,b] by using following inequality, (t has to be between 0 and 1)

3. Obtain the 10 target (output) datapoints for the following equation for uniformly spaced input

variable in the range [0,10].

where, *noise* can be Gaussian noise added to the actual signal.

Now, obtain the model parameters (theta) using gradient descent that will best fit to the corrupted data points. Plot the cost function *vs.* number of iterations. Also plot the data points, actual line and predicted line on the same figure.

Vary the number of datapoints and observe the number of iterations required for converge. Also vary the values of learning parameter (alpha) and observe its effect on convergence. You can also vary the slope and intercept values of the given line and validate the performance of gradient descent.

4. Find out the model parameters (theta) for above datapoints using psudo-inverse method.