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CS 383-002

Homework #3

**1. Theory**

1. Linear regression using least squares estimate (LSE).

Column 1 contains the sole feature, column 2 contains the value to be predicted

std of feature = 4.2282

mean of feature = -0.9

Standardized data with bias feature:

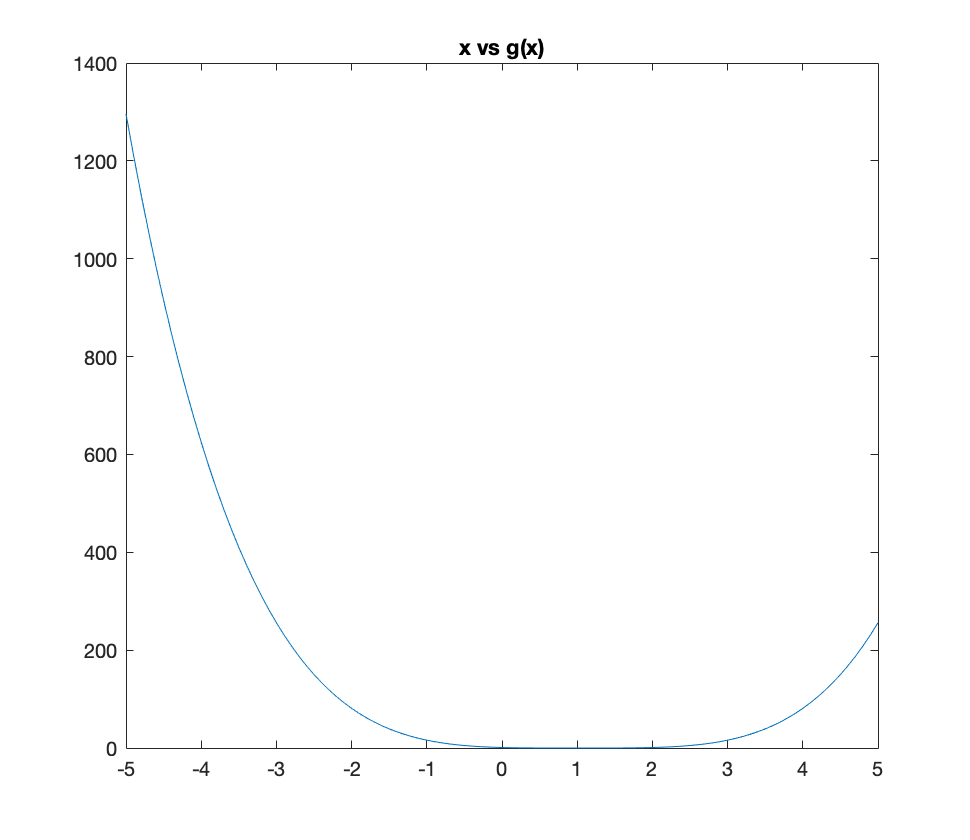
Calculate coefficients using:

2. Function

1. Gradient with respect to x:
2. Finding global minimum:

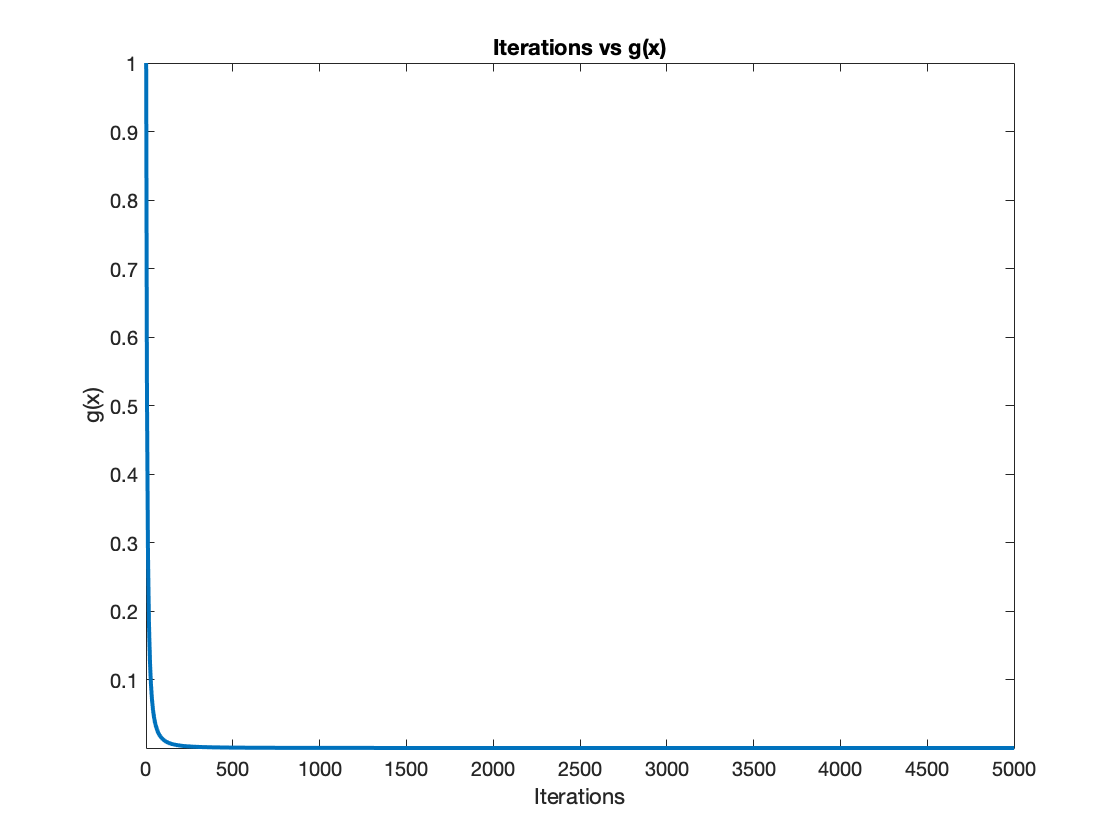
1. Plot x vs g(x) using MATLAB

x = -5 to 5 (in steps of 0.1)

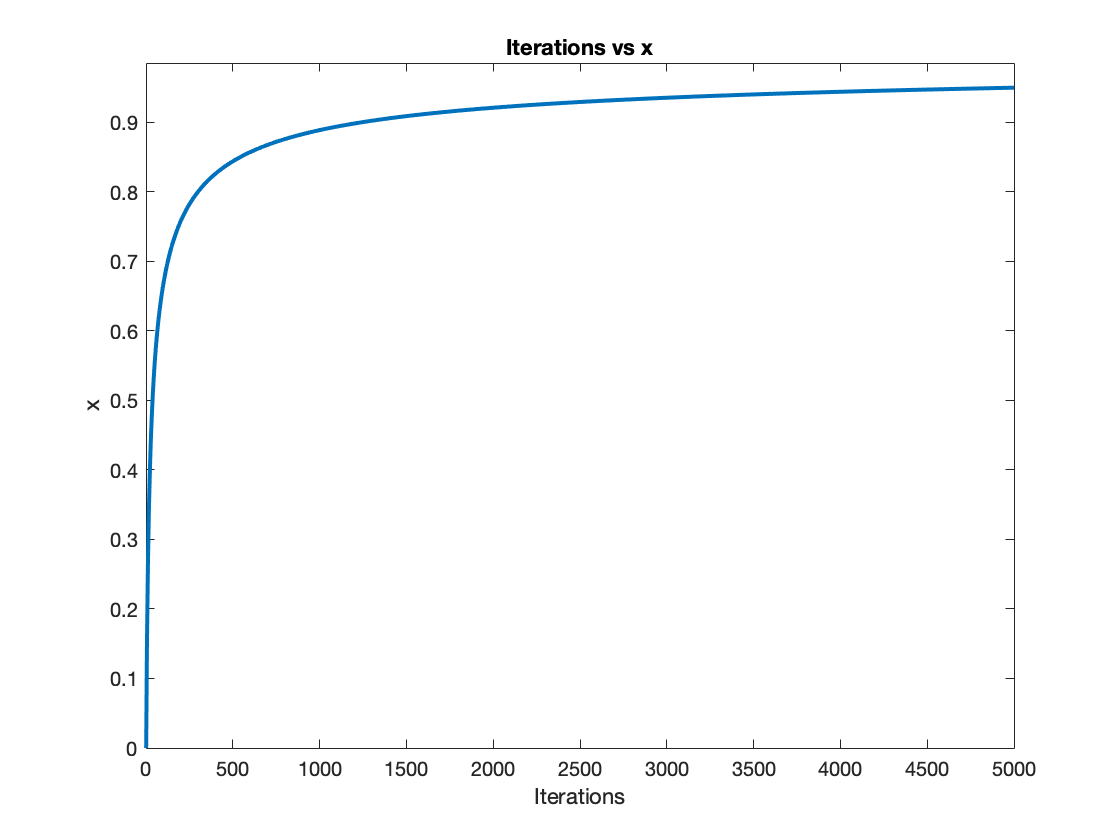


**2. Gradient Descent**

Fixed Learning Rate



Iterations vs g(x)  
Note: X axis adjusted

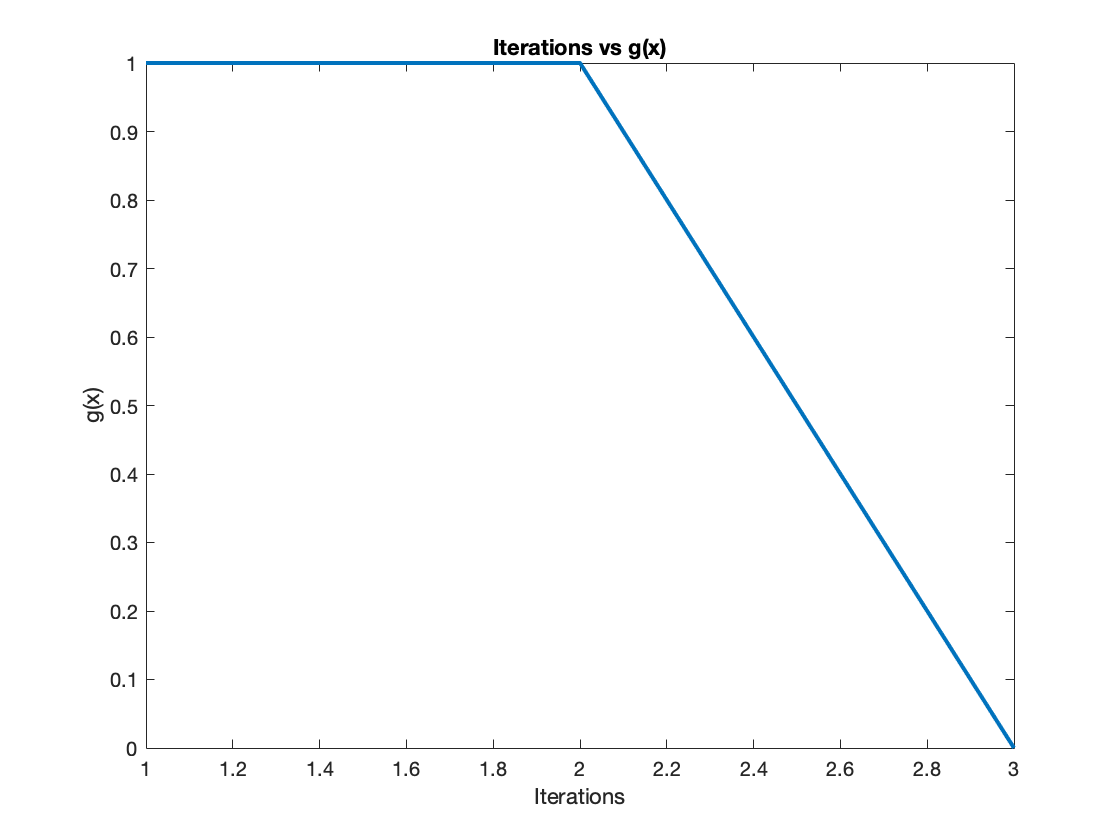


Iterations vs x

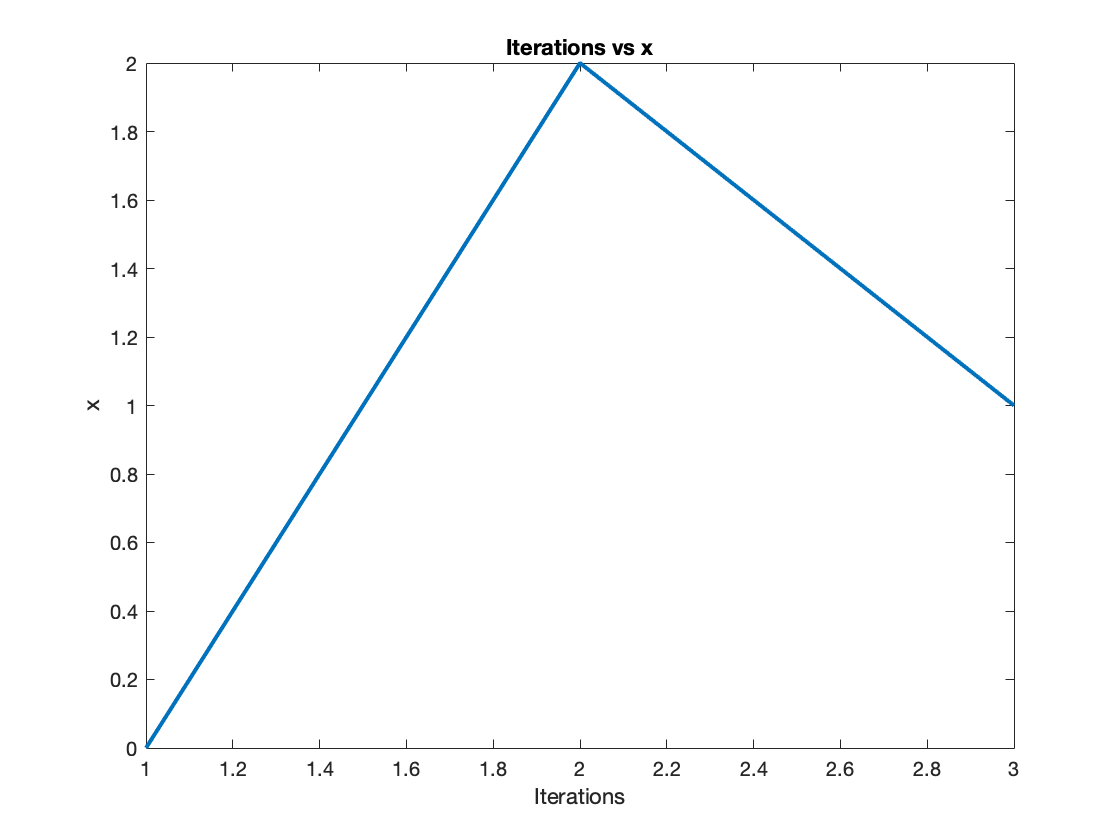
Note: X axis adjusted

Chosen value of n (learning rate) was 0.23

Adaptive Learning Rate



Iterations vs g(x)



Iterations vs x

**3. Closed Form Linear Regression**

Model:

|  |  |
| --- | --- |
| RMSE | 813.2411 |

**4. S-Folds Cross-Validation**

|  |  |  |
| --- | --- | --- |
| **S** | **Average RMSE** | **Std of RMSE** |
| 3 | 655.9816 | 45.5404 |
| 5 | 634.3463 | 23.6618 |
| 20 | 627.0605 | 12.6290 |
| N (= 44) | 623.4051 | 0 |