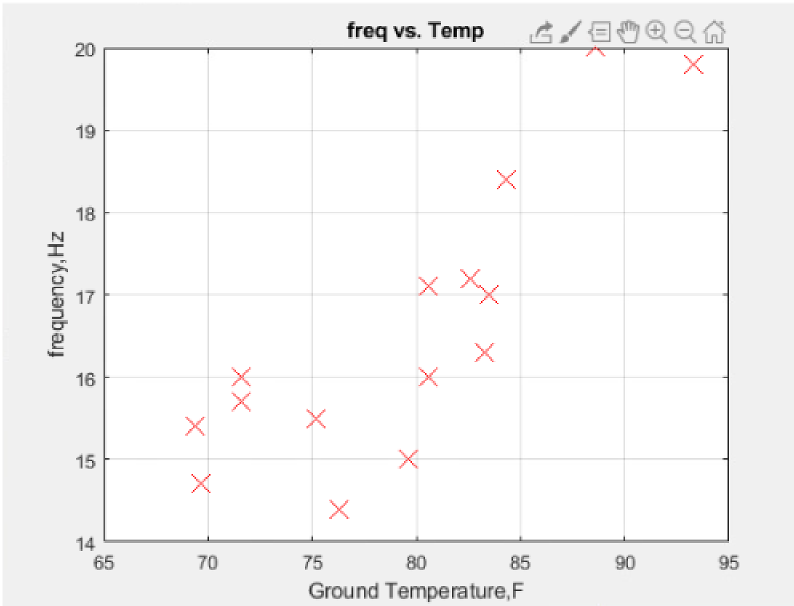
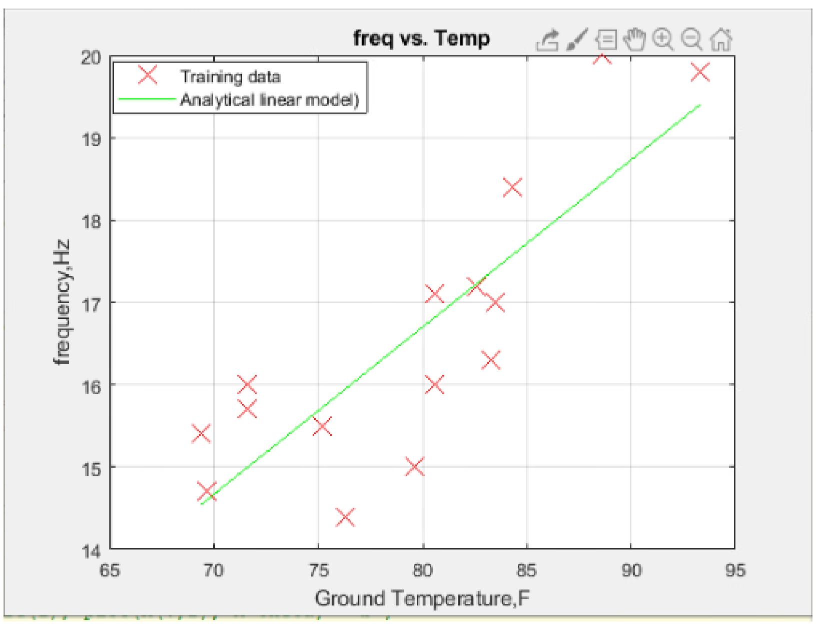
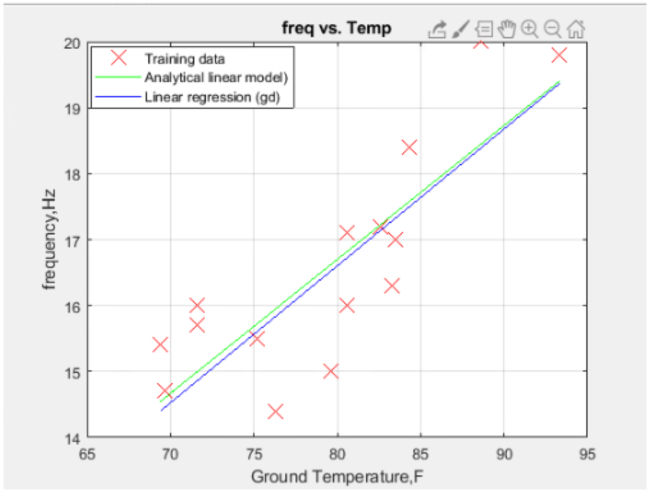
1)

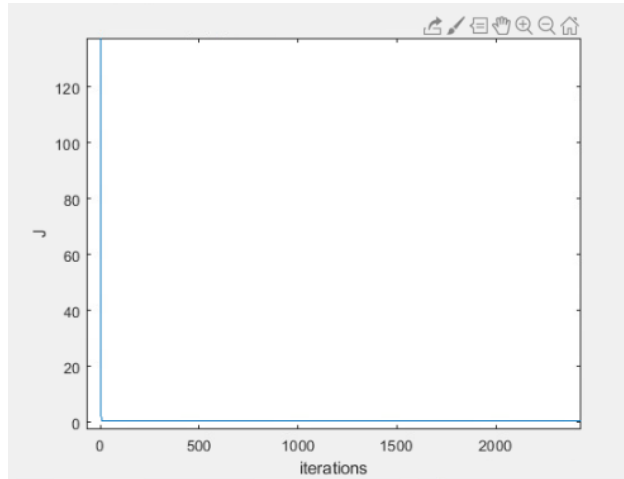
1) 
freq vs. Temp
frequency,Hz
Ground Temperature,F
20
19
18
17
16
15
14
65
70
75
80
85
90
95

2) 
freq vs. Temp
Training data
Analytical linear model)
frequency,Hz
Ground Temperature,F
20
19
18
17
16
15
14
65
70
75
80
85
90
95

3) Comparion of the Theta found by linear regression ()with alpha = 5e-6, iterations=2500) to that found analytically:

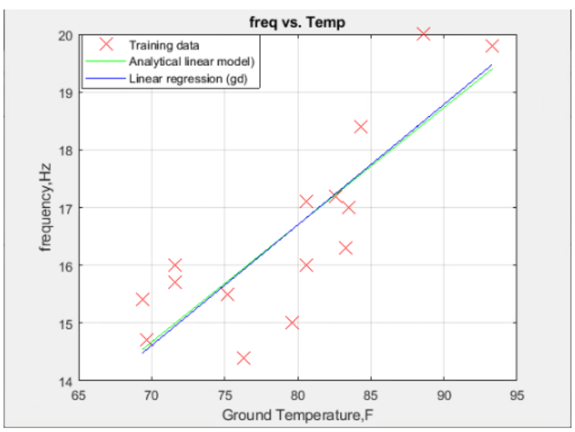
```
Theta found Analyticaly: 0.459315 0.203000
Theta found by gradient descent: 0.002943 0.207485
```

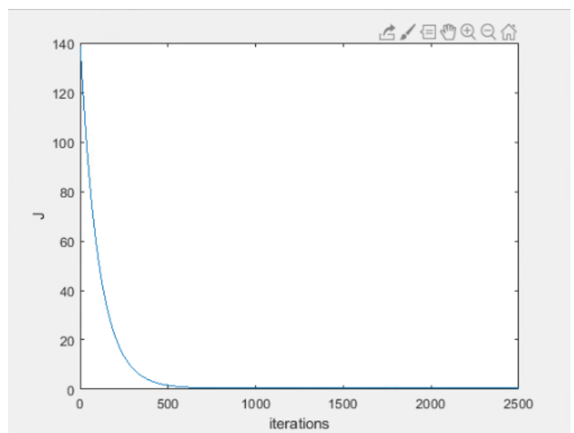




Comparion of the Theta found by linear regression ()with alpha = 5e-8, iterations=2500) to that found analytically:

```
Theta found Analyticaly: 0.459315 0.203000
Theta found by gradient descent: 0.002617 0.208700
```





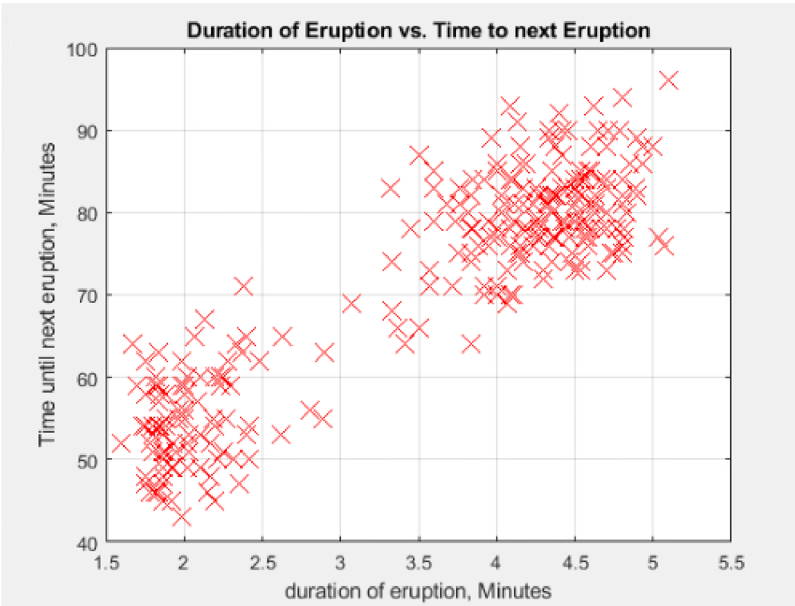
We can see that we did not need all 2500 iterations to reach an acceptabe value for our cost function

4)
```
For temperature = 91 degrees, we predict a freq of 18.994332 Hz
For temperature = 77 degrees, we predict a freq of 16.072530 Hz
```

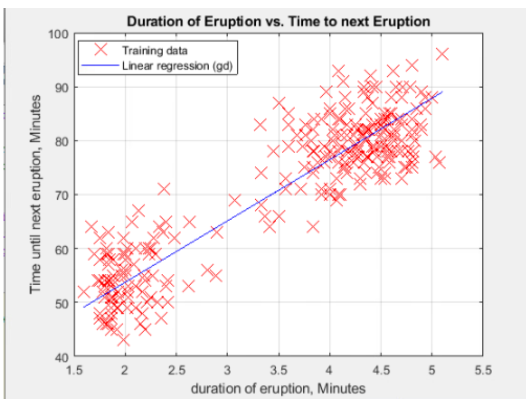
5)
```
For temperature = 50 degrees, we predict a freq of 10.437625 Hz
```

2)

1)



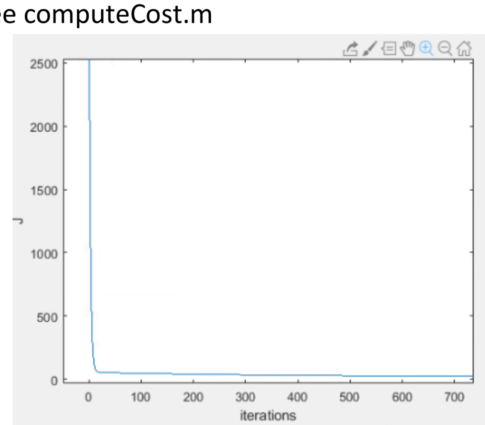
2)



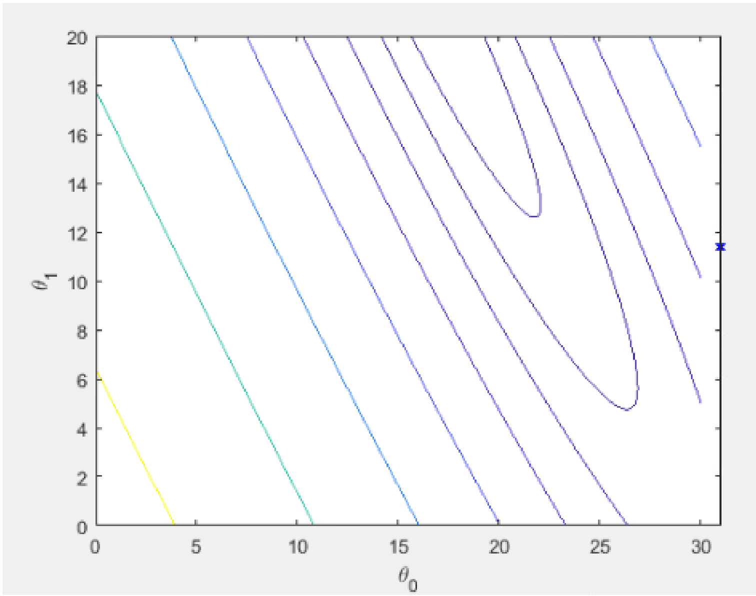
3)

```
For duration = 1.5 minutes, we predict the next eruption in 48.061149 minutes
For duration = 3 minutes, we predict the next eruption in 65.118113 minutes
For duration = 5 minutes, we predict the next eruption in 87.860732 minutes
```

4) see computeCost.m



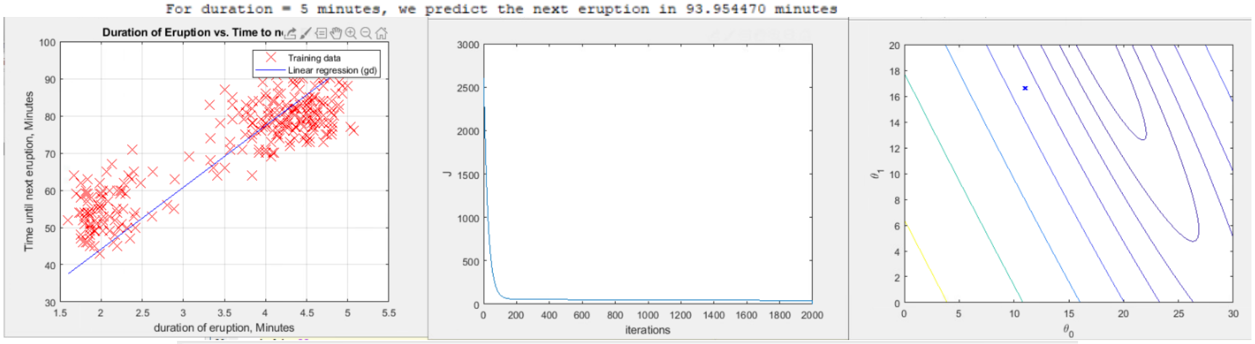
5)



6) previous graphs were using alpha = 5e-5

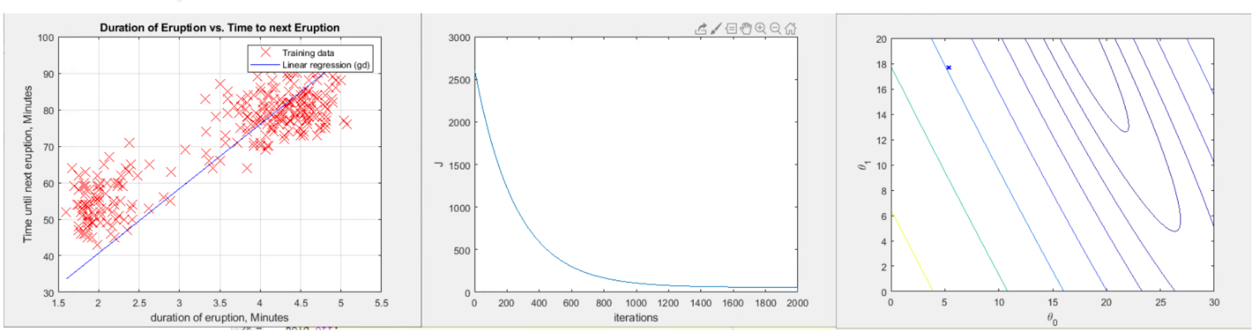
Alpha = 5e-6

```
Theta found by gradient descent: 11.002468 16.590400
For duration = 1.5 minutes, we predict the next eruption in 35.888068 minutes
For duration = 3 minutes, we predict the next eruption in 60.773669 minutes
For duration = 5 minutes, we predict the next eruption in 93.954470 minutes
```



Alpha=5e-7

```
Theta found by gradient descent: 5.352990 17.672474
For duration = 1.5 minutes, we predict the next eruption in 31.861700 minutes
For duration = 3 minutes, we predict the next eruption in 58.370411 minutes
For duration = 5 minutes, we predict the next eruption in 93.715358 minutes
```



3)

1) the dimensions of theta in this case are 3x1

Generally speaking, it is n+1, where n is the number of parameters

And we add 1 for theta0

2) with alpha = 0.001, we get our optimal theta after around 1250 iterations

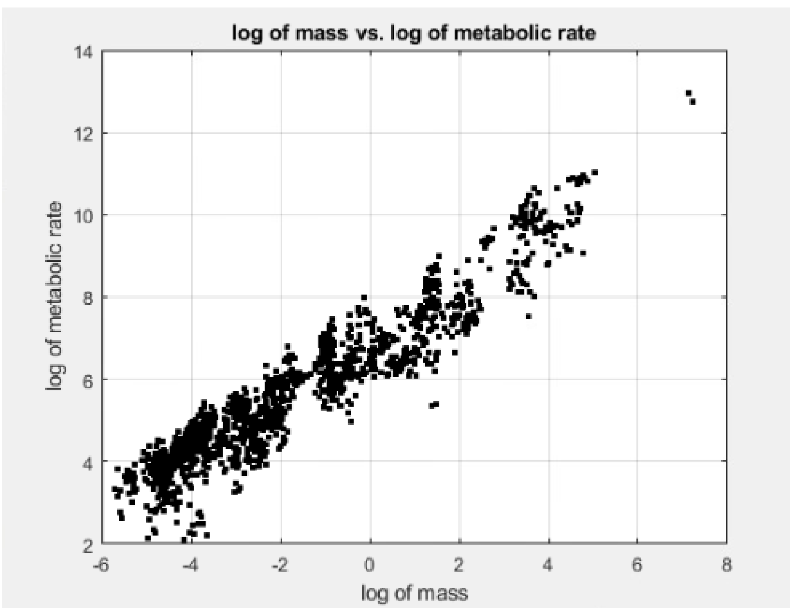
Which give us the following predictions: `For House with 1800 sf and 5 rooms,the predicted cost is $423134.13`

3) comparison of analytical vs linear regression:

```
Theta found by gradient descent: 340314.303042 110344.568321
For House with 1800 sf and 5 rooms,the predicted cost is $423134.13
Theta Analytical linear model: 340412.659574 110631.050279
For House with 1800 sf and 5 rooms,the predicted cost is $423342.51
```

4)

1)



2 and 3)

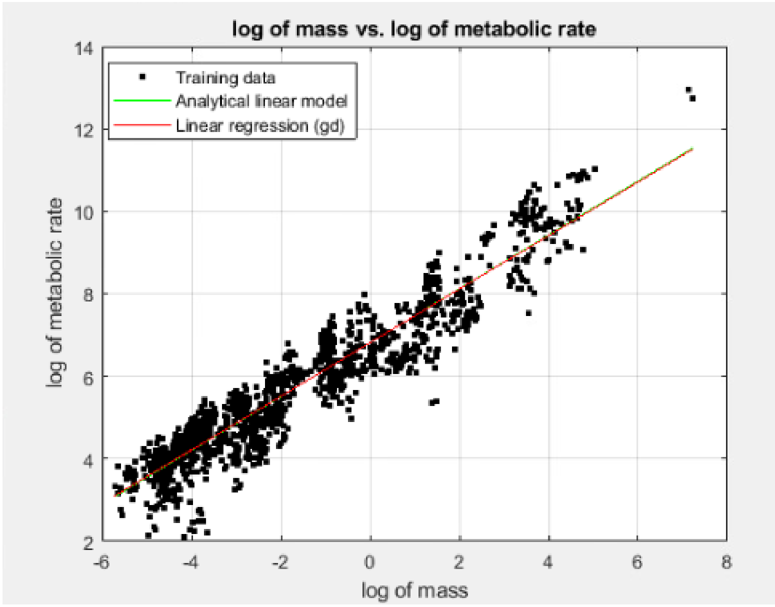
```
%log(htheta) = theta0+log(X)*theta;
%htheta = exp(log_htheta);
%can also be expressed as: htheta = theta0*year^theta1
%so we can find optimal theta by looking at the linear relationship between
%the logs and then calculting our prediction by taking e to the power of
%our hypotheis function
```

It is a log-log linear regression

So: our hypothesis function would be: y-= theta0*(year^theta1)

But, if we keep the cost function and linear descent we've been using to this point, we can get theta's the are optimal for log of our desired result/prediction (i.e. exp(theta0*(year^theta1)))

If we plot the analytical linear model vs the linear regression, we can see they almost overlap:



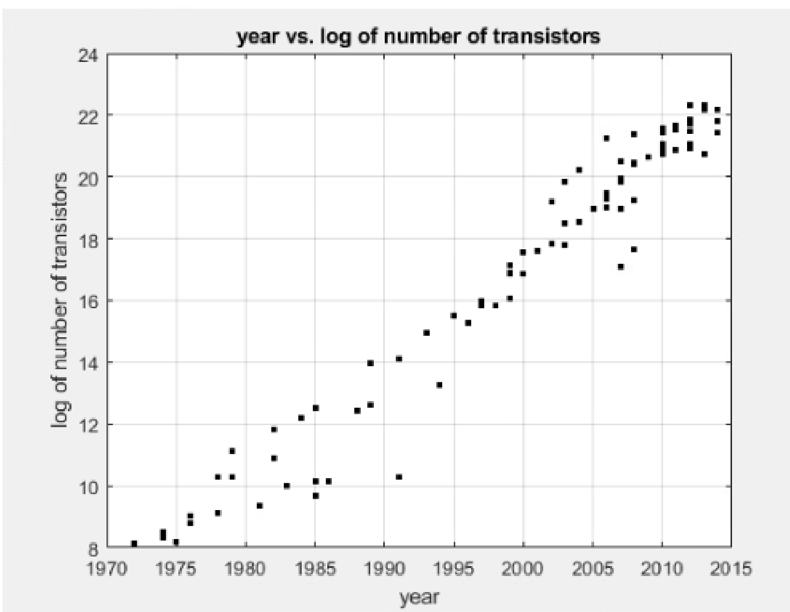
4 and 5)
```
predicted calories for a mammal weighing 15 kg is 1265.01
estimated weight for a mammal that needs 2.5 kJoul per day is : 1.143892e-04 kilograms
```

5)

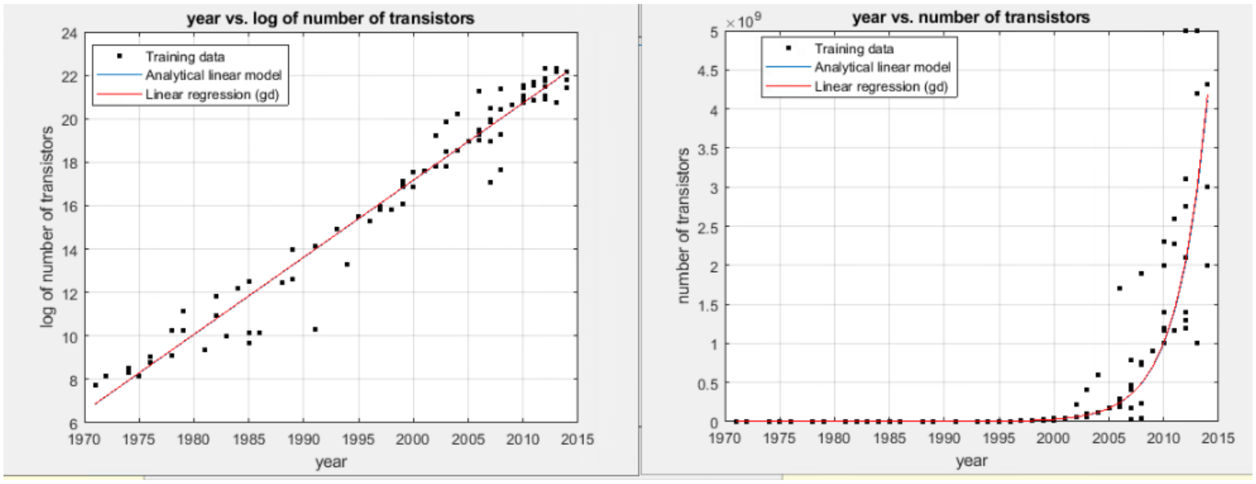
1) We can see there is exponential growth in the number of transistors

Therefore, the transformation is from y to log(y)

(Our hypothesis function is: log(y) = x*theta)



2)



3) `The predicted number of transistors in 2018 is is 1.749930e+10`