1. c) Reading inputs

In [2]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt

%matplotlib inline
```

In [3]:

```
filepath = "input.csv"

df = pd.read_csv(filepath, index_col = 0)
df = df.dropna(thresh=8) # drop rows with NaN values in any column
df = df.sample(frac=1) # shuffle the rows
df.head()
```

Out[3]:

	Regressor	Var1	Var2	Var3	Var4	Var5	Var6	Var7
Sl.No								
152	32.0	4	83.0	61.0	2003	19.0	74	3
279	23.8	4	151.0	85.0	2855	17.6	78	1
328	32.2	4	108.0	75.0	2265	15.2	80	3
383	36.0	4	105.0	74.0	1980	15.3	82	2
256	19.9	8	260.0	110.0	3365	15.5	78	1

In [4]:

```
# assuming Y is always the column next to index

Y = df.iloc[:,0].copy().values
X = df.iloc[:,1:].copy().values

no_x = X.shape[1] # no of independent variables

limit = 70*df.shape[0]//100 # for selecting 70% of data

Y_train = np.array(Y[:limit])
Y_test = np.array(Y[limit:])

X = np.transpose(X)
X = np.array([(i - np.mean(i))/(np.max(i)-np.min(i)) for i in X]) # normalising

X = np.transpose(X)
X_train = np.transpose(X[:limit])
X_test = np.transpose(X[limit:])
```

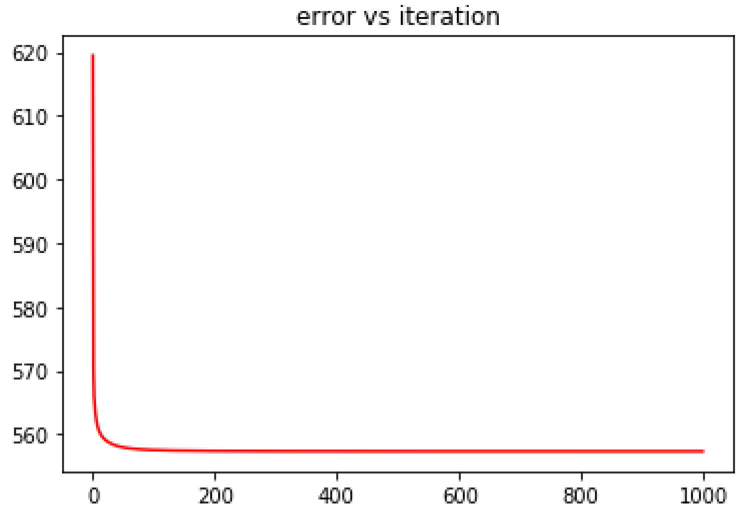
In [5]:

```
learning_rate = 1
error = []
W = np.zeros(no_x)

for _ in range(1000):
    Y_ = np.matmul(W, X_train)
    mse = np.mean((Y_train - Y_)**2)
    error.append(mse) # for plotting
    ct = 2*(Y_train - Y_) # common term in derivative
    dL_dw = np.array([ np.mean(ct*x_js) for x_js in X_train])
    W =  W + learning_rate*dL_dw

print("train_error : "+str(mse))
print("weights : "+str(W))
```

```
train_error : 557.290353621
weights : [  3.92331863  -7.8760789  -13.72747768  -4.79759385 -16.379
57457
  12.34614932   6.67171051]
```

In [6]:

```
plt.plot(range(len(error[:])),error[:], color="red")
plt.title("error vs iteration")
plt.show()
```



In [7]:

```
Y_ = np.matmul(W, X_test)
test_error = np.mean((Y_test - Y_)**2)
print("test_error : "+str(test_error))
```

```
test_error : 592.65360784
```