In [37]:

```
import numpy
import matplotlib.pyplot as plt
```

In [38]:

```
def sigmoid(val):
    return 1.0/(1+numpy.exp(-1*val))
```

In [39]:

```
def error(t,o):
    return 0.5*((t-o)**2)
```

In [40]:

```
def deriv_sigmoid(inp):
    return (sigmoid(inp)*(1-sigmoid(inp)))
```

In [41]:

```
x1=0.05
x2=0.1
w1=0.15
w2=0.2
w3=0.25
w4=0.3
w5=0.4
w6=0.45
t=0.01
l_rate=0.5
b1 = 0.35
b2 = 0.35
b3=0.60
```

In [42]:

```
predicted=[]
err = []
for i in range(200):
    #fp
    h1_in = w1*x1+w3*x2+b1
    h1 = sigmoid(h1_in)

    h2_in = w2*x1+w4*x2+b2
    h2 = sigmoid(h2_in)

    y_in = w5*h1+w6*h2+b3
    y = sigmoid(y_in)

    predicted.append(y)

    e = error(t,y)
    err.append(e)
    print("error--->",e)

    #bp
    del_k = (t-y)*deriv_sigmoid(y_in)

    del_w5 = l_rate*del_k*h1
    w5+= del_w5

    del_w6 = l_rate*del_k*h2
    w6+= del_w6

    #hidden layer
    del_j1 = del_k*w5*deriv_sigmoid(h1_in)

    del_w1 = l_rate*del_j1*x1
    w1+= del_w1

    del_w3 = l_rate*del_j1*x2
    w3+= del_w3

    del_j2 = del_k*w6*deriv_sigmoid(h2_in)

    del_w2 = l_rate*del_j2*x1
    w2+= del_w2

    del_w4 = l_rate*del_j2*x2
    w4+= del_w4
```

```
error---> 0.27484039145340705
error---> 0.2679990260146434
error---> 0.2610019601469986
error---> 0.2538642271139089
error---> 0.24660323429169495
error---> 0.23923867008893063
error---> 0.2317923326109041
error---> 0.22428787758260318
error---> 0.21675048769339492
error---> 0.2092064707187258
error---> 0.20168279904759592
error---> 0.19420660804903328
error---> 0.18680467448014823
```

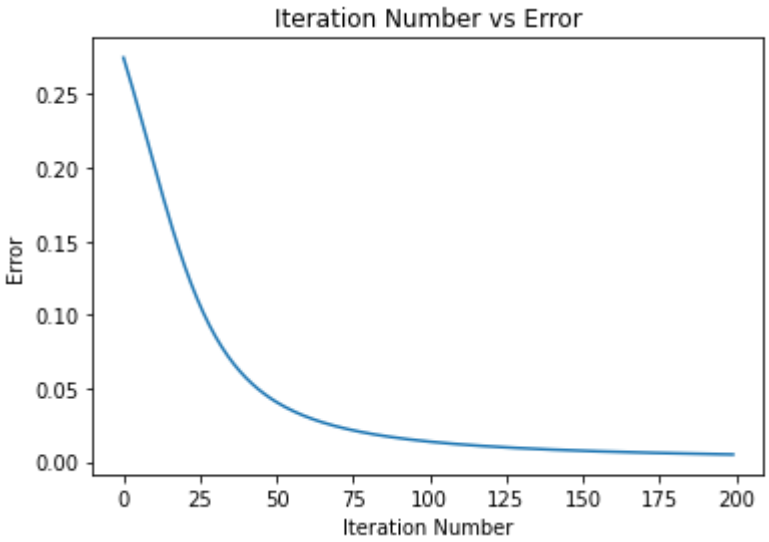
```
error---> 0.179502898379149
error---> 0.1723258122653917
error---> 0.1652961398771334
error---> 0.15843442326152402
error---> 0.1517587321707313
```

In [43]:

```
plt.figure()
plt.plot(err)
plt.title("Iteration Number vs Error")
plt.xlabel("Iteration Number")
plt.ylabel("Error")
```

Out[43]:

```
Text(0, 0.5, 'Error')
```



In [44]:

```
plt.figure()
plt.plot(predicted)
plt.title("Iteration Number vs Prediction")
plt.xlabel("Iteration Number")
plt.ylabel("Prediction")
```

Out[44]:

```
Text(0, 0.5, 'Prediction')
```