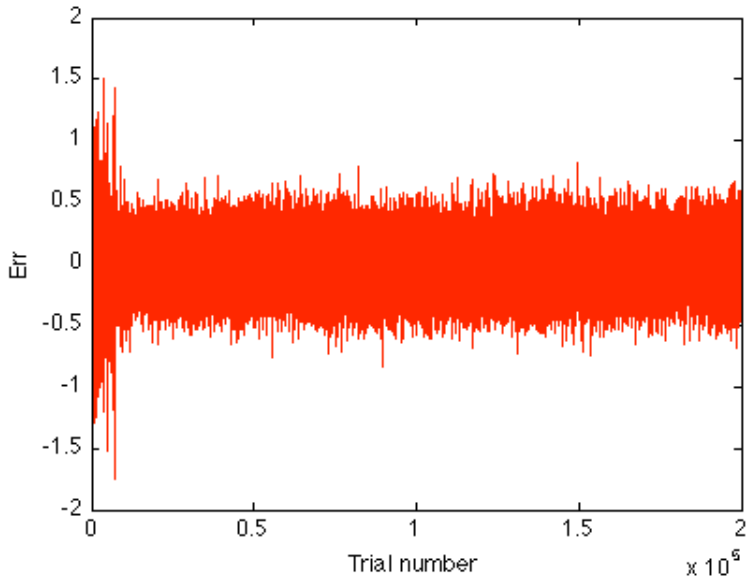
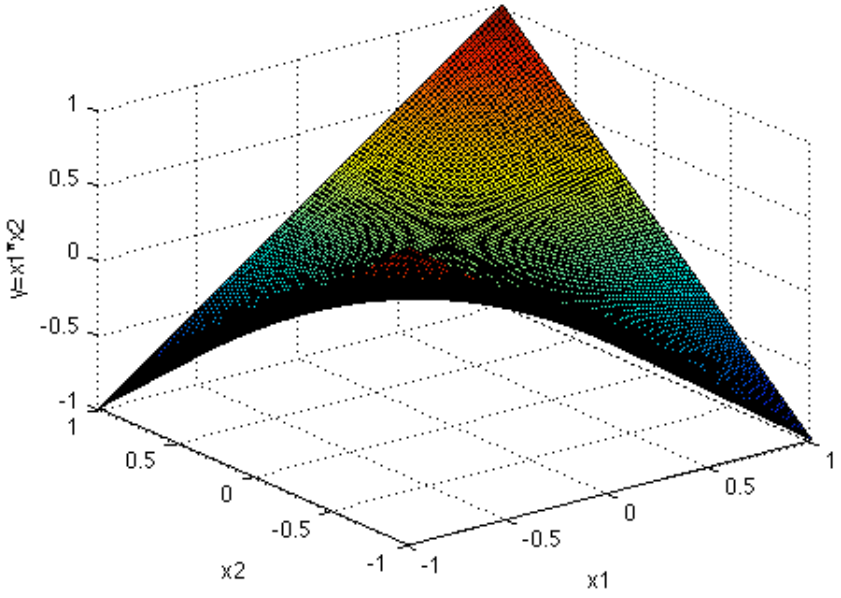
EX: A neural network with 25 logistic sigmoid neurons on its first layer and a single linear neuron in its second (output) layer trained for 200,000 trials has difficulty learning the multiplication function $y = x_1 \cdot x_2$ on domain D = [–1, 1] x [–1, 1].

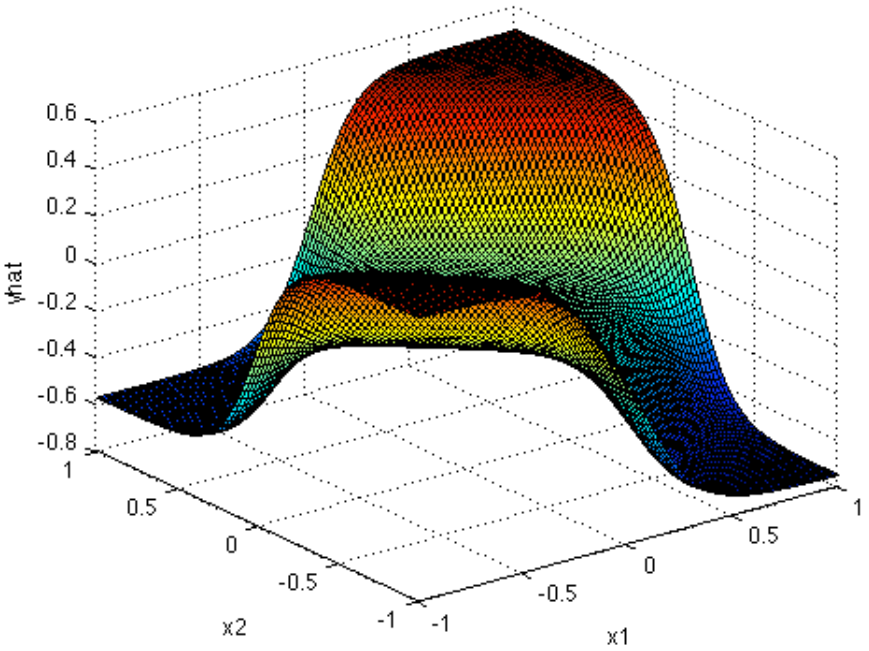
Final weights for the first and second layers are listed below:

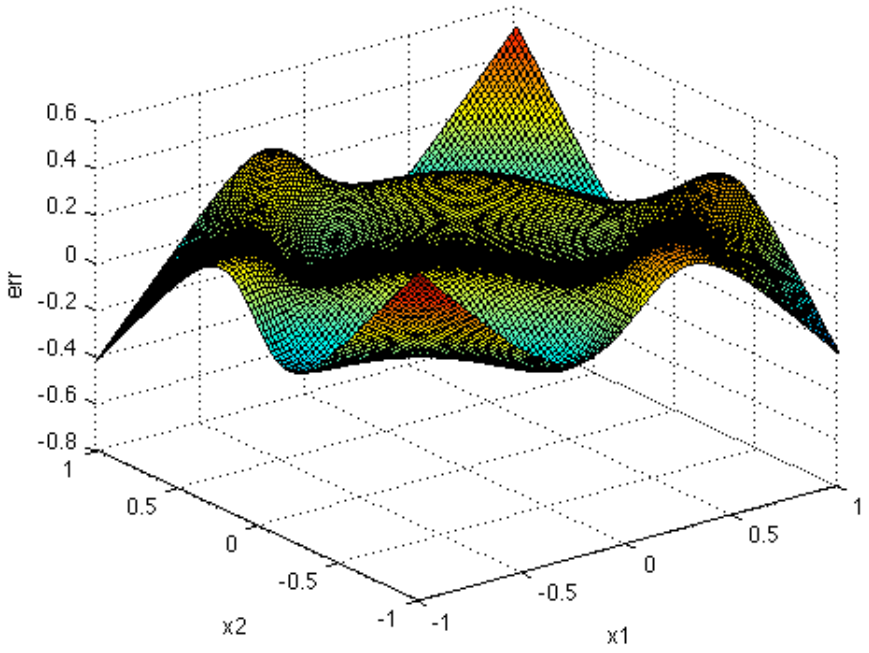
```
w_1 =                                          w_2 =
    7.6649    8.1156    8.7998                   -0.0328
    9.5488   10.0000  -10.0000                    0.2183
   -7.5367    8.7116   -9.1054                    0.0062
    0.0006    0.0067   -0.0051                   -0.0608
    7.6649    8.1156    8.7998                   -0.2323
   -7.9563    9.5336   -9.6013                   -0.0220
   -9.4098   -9.6692   -9.9233                    0.0342
   -9.5204    9.9568    9.5472                    0.0938
   -9.5204    9.9568    9.5472                    0.0938
    0.0009    0.0106   -0.0102                   -0.0679
   -9.5204    9.9568    9.5472                    0.0938
   -8.5776   -9.3234   -9.2043                    0.0199
    7.5816   -6.6083    8.1758                    0.1915
    9.4405   -8.2729    9.3958                    0.1068
   -7.9658    9.5348   -9.6022                   -0.0220
   -9.4101   -9.6691   -9.9232                    0.0342
   -0.0679   -0.2972   -0.3062                    0.0926
  -10.0000  -10.0000   10.0000                   -0.0980
   -7.9658    9.5349   -9.6023                   -0.0220
   -5.9713    7.1228   -7.7550                   -0.0854
    8.7801   -9.7010   -8.1176                   -0.2928
    8.6184   -7.3914    8.9203                    0.1498
  -10.0000  -10.0000   10.0000                   -0.0980
   -9.5204    9.9568    9.5472                    0.0938
    0.0004    0.0057    0.0060                   -0.0389
```

NOTE: $x_0 = 1$ acts as a threshold input.




y=x1*x2
1
0.5
0
-0.5
-1
x2
x1


yhat
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
x2
x1


0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
err
1
0.5
0
-0.5
-1
x2
-1
-0.5
0
0.5
1
x1