ENEE 434 Homework 1
Due Th 02/12/04

#1. 25 points (square law function approximation)

It is desired to approximate $y=x^2$ by a neural network over the domain $-2 \leq x \leq 2$.

a) set up a three layer feedforward network using newff with tansig as the activation function for the input layer of five neurons and the hidden layer of three neurons; use purelin for the output layer. Train with 20 equally spaced exemplars and then run with 200 inputs.

b) plot your results before training and after training for 50 epochs.

c) calculate the rms error.

d) train with 200 equally spaced exemplars and test with 400 inputs; compare the rms error with that of c).

e) explain why the output activation function should not be chosen as hardlim and why the input and hidden layers should not both be purelin.

#2. 25 points (cubic function approximation)

a) repeat problem #1a)&b) for $y=x^3$.

b) use gensim and run the neural network in simulink.

c) change the function to be $y= x^3 1(x)$ where 1(.) is the unit step function.

#3. 50 points (signal separation)

It is desired to separate 2-vector signals for which the first component is bigger than 5 (that is, P[1]>5) and the second component is less than -3 (that is P[2]<-3) from all other signals.

a) Set up a feedforward neural network with an input layer of 4 neurons with activation functions tansig, one hidden layer with 4 neurons of activation function logsig, and an output layer with one neuron having hardlim as the activation function. Use a training set having P=[-10:2:10; 10:-2:-10] and use newff. Check with ten different inputs to see if they get properly separated.

b) Use gensim and run the neural network in simulink.

Revisions of 02/08/04:

a) the second d) of #1 is changed to e)

b) hint for #3: for training change the hardlim to purelin and then after training change it back to hardlim (because newff will not properly train when a non-differentiable activation function is present).