1. Written assignment (from the textbook):
   (a) 4.1
   (b) 4.2: (by hand with only *integers* for the weights, not by a program to gain a better understanding) specify the weights and include two tables for the values in the perceptron:
      rows=input combinations
      i. $A \land \neg B$
      columns=input, output values (before and after threshold)
      ii. $AxorB$
      columns=input, hidden, output values (before and after threshold)
   (c) 4.9
   (d) With the programming assignment:
      i. discuss the hidden values in testIdentity using 3 and 4 hidden units (Why do 4 hidden units also work? What do the hidden values represent? Any significant difference in the number of iterations to convergence and why?)
      ii. compare performance of using validation set to not using it in testIrisNoisy

2. Programming assignment: Implement the back propagation algorithm for a feed forward artificial neural network with one hidden layer.
   (a) Your implementation should include at least these input parameters:
      i. number of hidden units
      ii. learning rate
      iii. momentum
      iv. stopping criterion (e.g. number of iterations)
   (b) Test your implementation with the following data sets:
      i. Identity (on course web site)
      ii. Tennis (same as HW2)
      iii. Iris (same as HW2)
   (c) For each of the following experiments, provide a script/program/function (using parameter values you found are appropriate) for running the test:
      i. testIdentity: output accuracy on training set and hidden values for each input (similar to the format in Figure 4.7) using 3 and 4 hidden units
      ii. testTennis: output accuracy on training and test sets.
      iii. testIris: output accuracy on training and test sets.
      iv. testIrisNoisy: corrupt 0% to 20% of class labels, with 2% increment, in the training set (similar to HW2); for each level of noise, output accuracy on the uncorrupted test set; use a validation set and not use a validation set (optionally use weight decay)
   (d) For discrete input/output attributes, you might want to have a pre-processor to convert them to 1-of-n representation.
   (e) The same program should be able to handle the different data sets.
   (f) Use C (GNU gcc), C++ (GNU g++), Java (Oracle Java), LISP (CLISP), or Python. If you don’t have a preference, use Java since it’s more portable.
   (g) Your submission will be evaluated on code01.fit.edu (linux).
   (h) Submission:
      i. README.txt: how to compile and run the four tests on code01.fit.edu
      ii. source code