Homework 4
due May 8, 2013

1. Implement in the language of your choice the learning algorithm for the perceptron (Rosenblatt variant). You should submit
   - the source code;
   - at least three runs on the data sets supplied below, using training rates of \( \eta = 0.02 \), \( \eta = 0.05 \) and \( \eta = 0.10 \).
   - your observations regarding the separating hyperplane and the number of steps executed by the algorithm

The data sets to test are:

\[
\begin{align*}
\mathbf{x} & = \begin{bmatrix} 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \end{bmatrix} \\
\mathbf{y} & = \begin{bmatrix} 1 \\ -1 \\ -1 \\ -1 \\ -1 \\ 1 \\ 1 \\ 1 \\ -1 \end{bmatrix}
\end{align*}
\]

and

\[
\begin{align*}
\mathbf{x} & = \begin{bmatrix} 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \end{bmatrix} \\
\mathbf{y} & = \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ -1 \\ -1 \\ -1 \\ -1 \end{bmatrix}
\end{align*}
\]

2. (optional) Implement the dual algorithm.

Note: It is OK to discuss the homework with colleagues who take this class with you, or to ask me questions; however, I insist that each student writes his or her own solutions! Please be clear and write neatly (preferably, use LaTeX or MS Word).