CISC271
Fall 2006
Homework for week 4
in preparation for quiz 2

This homework will give you some practice with linear algebra and Gaussian elimination.

1. Recktenwald Chapter 7. questions 2, 3 and 7.

   Note: These are review questions. Solutions will not be posted for the questions from Chapter 7.

2. Recktenwald Chapter 8. questions 16, 23 and 28.

3. Taken from Cleve B. Moler, Numerical Computing with MATLAB, SIAM, (2004)

   Alice buys 3 apples a dozen bananas, and one cantaloupe for $2.36. Bob buys a dozen apples, and two cantaloupes for $5.26. Carol buys two bananas and 3 cantaloupes for $2.77. How much do single pieces of fruit cost?

4. Taken from Cleve B. Moler, Numerical Computing with MATLAB, SIAM, (2004)

   The matrix factorization

   LU = P A

   can be used to compute the determinant of A. We have det(L)det(U) = det(P)det(A) Because L is triangular with ones on the diagonal, det(L) = 1. Because U is triangular, det(U) = $u_{11}u_{22}u_{nn}$. Because P is a permutation, det(P) = +1 if the number of interchanges is even and ?1 if it is odd. So det(A) = $\pm u_{11}u_{22}u_{nn}$

   Modify the luPiv function (from Recktenwald) so that it returns four outputs:

```
function [L,U,pv] = luPiv(A,ptol)
% luPiv  LU factorization with partial pivoting
%
% Synopsis:  [L,U,pv] = luPiv(A)
```

```
%            [L,U,pv] = luPiv(A,ptol)
%
% Input:     A    = coefficient matrix
%               ptol = (optional) tolerance for detection of zero pivot
%                      Default:  ptol = 50*eps
%
% Output:    L,U = lower triangular matrix, L, and upper triangular
%                          matrix, U, such that A(pv,:) = L*U
%                pv  = index vector that records row exchanges used to select
%                       good pivots.  The row permutations performed during
%                       elimination can be applied to the right hand side vector
%                      with b(pv).  The L and U returned by luPiv are the
%                      factors of permuted matrix A(pv,:), which is equivalent
%                      to P*A where P is the permutation matrix created
%                         by the two statements P = eye(size(A));  P = P(pv,:).
%              sig =  +1 or -1 if pv is an even or odd permutation
```

Write a function mydet(A) that uses your modified luPiv to compute the determinant of A. In Matlab, the product $u_{11}u_{22}u_{nn}$ can be computed with prod(diag(U)).

Note: Question 2.11 is very similar to question 23 from chapter 8 of Recktenwald.