

Answers for exercises on LU factorization:

1.  $\vec{y} = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$ , and  $\vec{x} = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$ .

2.  $\vec{y} = \begin{bmatrix} -1 \\ -5 \\ -3 \end{bmatrix}$  and  $\vec{x} = \begin{bmatrix} -2 \\ 1 \\ -3 \end{bmatrix}$ .

3. If you follow exactly the procedure I showed you in class, the LU decomposition you'll end up with will be:  $L = \begin{bmatrix} 2 & 0 \\ -1 & 3 \end{bmatrix}$  and  $U = \begin{bmatrix} 1 & 4 \\ 0 & 1 \end{bmatrix}$ . (Other LU decompositions are possible.)  $\vec{x} = \begin{bmatrix} 3 \\ -1 \end{bmatrix}$ .

4. Using the procedure I showed you in class, the LU decomposition will be:  $L = \begin{bmatrix} -5 & 0 \\ 6 & -7 \end{bmatrix}$  and  $U = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}$ . (Other LU decompositions are possible.)  $\vec{x} = \begin{bmatrix} 4 \\ -1 \end{bmatrix}$ .

5. Using the procedure I showed you in class, the LU decomposition will be:  $L = \begin{bmatrix} 2 & 0 & 0 \\ 0 & -2 & 0 \\ -1 & 4 & -3 \end{bmatrix}$   
and  $U = \begin{bmatrix} 1 & -1 & -1 \\ 0 & 1 & -1 \\ 0 & 0 & 1 \end{bmatrix}$ . (Other LU decompositions are possible.)  $\vec{x} = \begin{bmatrix} -1 \\ 1 \\ 0 \end{bmatrix}$ .

For the rest, just the answers:

6.  $x_1 = 1, x_2 = -2, x_3 = 1$ .

7.  $x_1 = -1, x_2 = 1, x_3 = 0$ .

8.  $x_1 = -1, x_2 = 1, x_3 = 1$ .

9.  $x_1 = -3, x_2 = 1, x_3 = 2, x_4 = 1$ .

10.  $x_1 = 2, x_2 = -1, x_3 = 0, x_4 = 0$ .