

**Math 344 - Homework Assignment 3 - Due Jan. 30**

1. For each of the following elementary row operations, find a matrix  $E$  such that  $EA = B$ .

(1)  $(-3)R_1 + R_2 \rightarrow R_2$       (2)  $2R_2 + R_3 \rightarrow R_3$       (3)  $R_1 \leftrightarrow R_3$       (4)  $2R_2 \rightarrow R_2$

2. Matrix  $B = \begin{bmatrix} 1 & 4 & 1 \\ 0 & 2 & 1 \\ 0 & 3 & 1 \end{bmatrix}$  is reduced from matrix  $A$  by two elementary operations:

(1)  $(-2)R_1 + R_2 \rightarrow R_2$ ;      (2)  $-R_1 + R_3 \rightarrow R_3$ .

(a) Find the LU-factorization of matrix  $A$ .

(b) Solve the linear system  $Ax = LUx = \begin{bmatrix} 4 \\ 0 \\ 1 \end{bmatrix}$  by the Backward Substitution and the Forward

Substitution procedures.

3. Let  $A = \begin{bmatrix} 1 & -2 & 3 & 0 \\ 1 & -2 & 3 & 1 \\ 1 & -2 & 2 & -1 \\ 2 & 1 & 3 & -1 \end{bmatrix}$ . Find the permutation matrix  $P$  so that  $PA = LU$ , where  $L$  is lower triangular

with 1s on its diagonal and  $U$  is upper triangular matrix.

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1(a)(b), 4(a), 5(b), 10(a)(b), 12( $b_1$  only)

Extra points: 2, 10(c)