Last name _____

First name _____

LARSON—MATH 310—CLASSROOM WORKSHEET 06
Elimination and Backsolving

Review

- What is an *augmented matrix*?

$$\begin{array}{rrrr} 2x & -3y & = & 3 \\ 4x & -5y & +z = & 7 \\ 2x & -y & -3z = & 5 \end{array}$$

1. Write the augmented matrix corresponding to this system of linear equations.

We'll use row operations to get this matrix into upper triangular form.

2. Add -1· row 1 to row 3 $(-1\rho_1 + \rho_3)$.

3. Now add -2· row 1 to row 2 $(-2\rho_1 + \rho_2)$.

4. Finally add -2· row 2 to row 3 $(-2\rho_2 + \rho_3)$.

5. What you have should be in *upper triangular* form. Write the corresponding (simpler!) system of equations.

6. Back-solve. (And check your solution in the original system).

Elimination matrices

7. Find a matrix E which adds -1· row 1 to row 3 $(-1\rho_1 + \rho_3)$. Check by finding $E\vec{u}$ where $\vec{u} = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$.

8. Find a matrix E which adds -2· row 1 to row 2 $(-2\rho_1 + \rho_2)$. Check by finding $E\vec{u}$.

9. Find a matrix E which adds -2· row 2 to row 3 $(-2\rho_2 + \rho_3)$. Check by finding $E\vec{u}$.

We talked about row operations for solving a system of linear equations: (1) add a multiple of one equation to another, (2) multiple any equation by a non-zero scalar, and (3) switch the order of any pair of equations. None of these operations changes the solutions of the system.

10. Find a matrix E which multiplies row 3 by 5 $(5\rho_3)$. Check by finding $E\vec{u}$.

11. Find a matrix E which switches rows 1 and 2 $(\rho_1 \leftrightarrow \rho_2)$. Check by finding $E\vec{u}$.

12. Rewrite our original system of equations in matrix form and solve by using elimination matrices.