

Last name \_\_\_\_\_

First name \_\_\_\_\_

LARSON—MATH 310—CLASSROOM WORKSHEET 08  
Matrix Multiplication

Review

- Find a matrix  $E$  which multiplies row 3 by 5 ( $5\rho_3$ ).
- Find a matrix  $E$  which switches rows 1 and 2 ( $\rho_1 \leftrightarrow \rho_2$ ).
- What is the column definition of matrix multiplication?
- Find:

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ -5 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & 2 \\ 3 & -1 & 1 \\ 5 & -1 & 5 \end{bmatrix}$$

Let  $A = \begin{bmatrix} 0 & 1 \\ -1 & 2 \end{bmatrix}$ , and  $B = \begin{bmatrix} 3 & 4 \\ 5 & 6 \end{bmatrix}$

1. Find  $AB$  using the column definition.
2. Find  $AB$  using the dot product of rows and columns definition.
3. Find  $BA$ .
4. What do you notice?

5. Let

$$E_{13} = \begin{bmatrix} 1 & 0 & -1 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}.$$

What does  $E_{13}$  do? Find a matrix  $E'_{13}$  that “reverses” what  $E_{13}$  does. Check that  $E_{13}$  and  $E'_{13}$  are inverses.

6. Let

$$E_{32} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 5 & 1 \end{bmatrix}.$$

What does  $E_{32}$  do? Find a matrix  $E'_{32}$  that “reverses” what  $E_{32}$  does. Check that  $E_{32}$  and  $E'_{32}$  are inverses.

7. Let

$$P_{12} = \begin{bmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}.$$

What does  $P_{12}$  do? Find a matrix  $P'_{12}$  that “reverses” what  $P_{12}$  does. Check that  $P_{12}$  and  $P'_{12}$  are inverses.

8. Let  $D = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 4 \end{bmatrix}$ . Let  $\vec{x} = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$ . Find  $D\vec{x}$ . What is the effect of multiplication of  $D$  times a vector? (And then what is the effect of multiplication of  $D$  times a matrix?)

9. Find:

$$\begin{bmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 4 \end{bmatrix} \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$

10. Find a matrix  $D'$  that “reverses” what multiplication by  $D$  does. Check that  $D$  and  $D'$  are inverses.