

# Math 220 Assignment

November 9, 2001

Due Monday, November 12

Bear in mind the following:

**Definition.** A square matrix is called an elementary matrix if it is the matrix that results from applying an elementary row operation to an identity matrix of the same size.

1. Describe the elementary row operations corresponding to each of the following elementary matrices:

$$\begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 3 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix} \quad \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & -2 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix} \quad \begin{pmatrix} 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix} \quad \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ -2 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix} .$$

2. Find the determinants of each of the elementary matrices in exercise 1.
3. Find the inverses of each of the elementary matrices in exercise 1.
4. Find the product of the four elementary matrices in exercise 1.
5. Show that if  $E$  is an  $m \times m$  elementary matrix and  $M$  is any  $m \times n$  matrix, then the product matrix  $EM$  is the matrix obtained by applying the elementary row operation corresponding to  $E$  to the matrix  $M$ .
6. Show that if  $E$  is an  $m \times m$  elementary matrix and  $M$  is any  $m \times n$  matrix, then

$$\det(EM) = \det(E)\det(M) .$$

Document network location for HTML:

<http://math.albany.edu:8000/math/pers/hammond/course/mat220/assgt/1a011109.html>