

MATH 4377, SECTION 33224
HOMEWORK
DUE THURSDAY, SEPTEMBER 4th

1. Find the row -reduced echelon form of the matrix $\begin{bmatrix} 1 & 1 & 2 & 1 & 1 \\ 2 & 1 & 1 & 2 & 1 \\ 3 & 2 & 3 & 3 & 2 \\ 1 & 0 & -1 & 1 & 0 \end{bmatrix}$

2. Find the inverse of each of these matrices :

(a) $\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 2 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$

(b) $\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$

(c) $\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 3 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$

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

25 pts

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

$$\sim \begin{bmatrix} 1 & 0 & -1 & 1 & 0 \\ 0 & 1 & 3 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix} = \text{ANS.}$$

2. Each is an elementary matrix:

(a) The matrix is obtained by adding 2 times row 2 to row 4 of the 5×5 identity matrix

\therefore its inverse is obtained by adding -2 times row 2 to row 4

25 pts of the identity 5×5 matrix

$$\text{ie inverse} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & -2 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$

(b) The matrix is obtained by interchanging the 2nd & 4th rows of the identity matrix.

It is its own inverse.
25 points.

(c) The matrix is obtained by multiplying the third row of the 5×5 identity matrix by 3.

25 pts

\therefore Its inverse is obtained by dividing the third row of the 5×5 identity matrix by 3.

$$\text{inverse} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & \frac{1}{3} & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$