Chapter 6: Linear Equations and Matrix Algebra

Section 6.3 Cont.: Inverse Matrix

To find the inverse matrix of $A = \begin{bmatrix} 2 & 1 \\ 1 & 1 \end{bmatrix}$ using the All Integer Method:

 Step 1: Re-write it with the Identity Matrix I next to it on the right side: (The Identity Matrix I: the square matrix where all Diagonal elements = 1, the rest are zeros)

Step 2: Do the pivot steps (2 pivots for two rows), and the last step should be:

$$A^{-1} = \begin{vmatrix} 1 & -1 \\ -1 & 2 \end{vmatrix} \qquad \qquad A = \begin{bmatrix} 1 & -1 \\ -1 & 2 \end{bmatrix}$$

You can check your answer by multiplying the original matrix A and the inverse A^{-1} . The answer must be an Identity Matrix I.

Note: Not every matrix has an inverse, for example: $A = \begin{bmatrix} 2 & 1 \\ 4 & 2 \end{bmatrix}$ does not have an inverse (the second pivot is zero).

Solve the same example and show steps

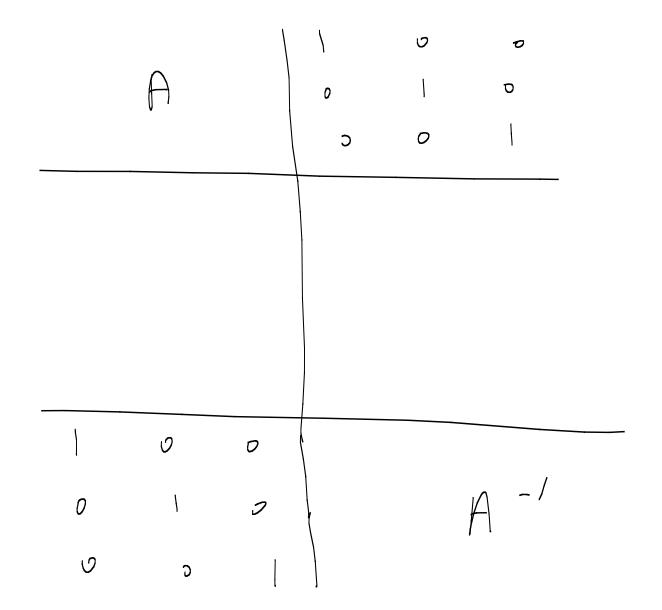
<u>Examples</u>: Find the inverse matrix for each of the following and check your answer by multiplying the original matrix by its inverse, the resulting matrix must be an Identity Matrix:

1)	1	1
	2	4

$$2)\begin{vmatrix} 1 & 0 \\ 3 & -2 \end{vmatrix}$$

2)
$$1^{\frac{1}{4}} \quad 0 \quad 1 \quad 0$$
 $3 \quad -2 \quad 0 \quad 1$
 $1 \quad 0 \quad 0 \quad 0$
 $0 \quad -2^{\frac{1}{4}} \quad -3 \quad 0$
 $0 \quad -2 \quad -3 \quad 0$
 $0 \quad -2 \quad -3 \quad 0$
 $0 \quad 1 \quad 3/2 \quad -\frac{1}{2}$
 $1 \quad 0 \quad 1 \quad 0$
 $1 \quad 3/2 \quad -\frac{1}{2}$
 $1 \quad A \quad 0 \quad 1$

Note: Not every matrix has an inverse, for example: $A = \begin{bmatrix} 2 & 1 \\ 4 & 2 \end{bmatrix}$ does not have an inverse (the second pivot is zero).



Find the inverse of the following 3x3 matrix:

$$A = \begin{vmatrix} 2 & 1 & 1 \\ 1 & 2 & -1 \\ 1 & 1 & 1 \end{vmatrix}$$

Original Matrix A		Identity matrix I			
2×	1	1	1	0	0
1	2	-1	0	1	0
1	1	1	0	0	1
2	1	1	1	0	0
0	3	-3	-1	2	0
0	1	1	-1	0	2
3	0	3	2	-1	0
0	3	3 -3 3	-1	2	0
0	0	3	-1	-1	3
3	0	0	3	0	-3
0	3	0	-2 -1	1	3
0	0	3	-1	-1	3
1	0	0	1	0	-1
0	1	0	- 2/3	1/3	1
0	0	1	- 1/3	- 1/3	1
	I			A^{-1}	