

## College Math – Row Operations with the TI-83/TI-84

Ex. Solve the system using Gauss-Jordan elimination.

$$\begin{cases} 4x_1 - 2x_2 + 3x_3 = 3 \\ 3x_1 - x_2 - 2x_3 = -10 \\ 2x_1 + 4x_2 - x_3 = -1 \end{cases} \longrightarrow \left[ \begin{array}{ccc|c} 4 & -2 & 3 & 3 \\ 3 & -1 & -2 & -10 \\ 2 & 4 & -1 & -1 \end{array} \right]$$

Start by entering the matrix on the calculator:



Enter each element in the matrix and exit.

Now we need to perform row operations to get the matrix in reduced form.

$$\left[ \begin{array}{ccc|c} 4 & -2 & 3 & 3 \\ 3 & -1 & -2 & -10 \\ 2 & 4 & -1 & -1 \end{array} \right] \quad \frac{1}{4}R_1 \rightarrow R_1$$



\*row(



\*row( 1/4, [A] , 1)

$$\left[ \begin{array}{ccc|c} 1 & -.5 & .75 & .75 \\ 3 & -1 & -2 & -10 \\ 2 & 4 & -1 & -1 \end{array} \right] \quad -3R_1 + R_2 \rightarrow R_2$$



\*row+(



\*row+( -3, Ans, 1, 2 )

$$\left[ \begin{array}{ccc|c} 1 & -.5 & .75 & .75 \\ 0 & .5 & -4.25 & -12.25 \\ 2 & 4 & -1 & -1 \end{array} \right] \quad -2R_1 + R_3 \rightarrow R_3$$

2nd ENTER

Arrow up and over and change accordingly.

\*row+( -2, Ans, 1, 3 )

$$\left[ \begin{array}{ccc|c} 1 & -.5 & .75 & .75 \\ 0 & .5 & -4.25 & -12.25 \\ 0 & 5 & -2.5 & -2.5 \end{array} \right]$$

Now, repeat the process for the second column.

$$\left[ \begin{array}{ccc|c} 1 & -.5 & .75 & .75 \\ 0 & .5 & -4.25 & -12.25 \\ 0 & 5 & -2.5 & -2.5 \end{array} \right] \quad 2R_2 \rightarrow R_2$$

2nd  $x^{-1}$  ) ^ ^ ENTER  
 2 , 2nd (-) , 2 ) ENTER

\*row( 2, Ans, 2)

$$\left[ \begin{array}{ccc|c} 1 & -.5 & .75 & .75 \\ 0 & 1 & -8.5 & -24.5 \\ 0 & 5 & -2.5 & -2.5 \end{array} \right] \quad \begin{array}{l} .5R_2 + R_1 \rightarrow R_1 \\ -5R_2 + R_3 \rightarrow R_3 \end{array}$$

2nd  $x^{-1}$  ) ^ ^ ENTER  
 . 5 , 2nd (-) , 2 , 1 ) ENTER

\*row+( .5, Ans, 2, 1 )

2nd ENTER

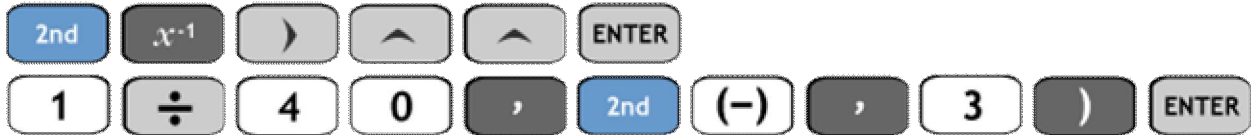
Arrow up and over and change accordingly.

\*row+( -5, Ans, 2, 3 )

$$\left[ \begin{array}{ccc|c} 1 & 0 & -3.5 & -11.5 \\ 0 & 1 & -8.5 & -24.5 \\ 0 & 0 & 40 & 120 \end{array} \right]$$

Now, repeat the process for the third column.

$$\left[ \begin{array}{ccc|c} 1 & 0 & -3.5 & -11.5 \\ 0 & 1 & -8.5 & -24.5 \\ 0 & 0 & 40 & 120 \end{array} \right] \quad \frac{1}{40}R_3 \rightarrow R_3$$



\*row( 1/40, Ans, 3)

$$\left[ \begin{array}{ccc|c} 1 & 0 & -3.5 & -11.5 \\ 0 & 1 & -8.5 & -24.5 \\ 0 & 0 & 1 & 3 \end{array} \right] \quad \begin{array}{l} 3.5R_3 + R_1 \rightarrow R_1 \\ 8.5R_3 + R_2 \rightarrow R_2 \end{array}$$



\*row+( 3.5, Ans, 3, 1 )



Arrow up and over and change accordingly.

\*row+( 8.5, Ans, 3, 2 )

$$\left[ \begin{array}{ccc|c} 1 & 0 & 0 & -1 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 3 \end{array} \right]$$

Solution:  $x_1 = -1, x_2 = 1, x_3 = 3$

You can now use your calculator to help aid you in your row operations, but make sure that you are still writing each row operation and resulting matrix.