

Name:

KEY

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MATH-260

Term-082

QUIZ-3

1) Circle the reduced row echelon matrix.

$$\begin{bmatrix} 0 & 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} \quad \begin{bmatrix} 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 5 \end{bmatrix} \quad \begin{bmatrix} 1 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 1 \end{bmatrix} \quad \begin{bmatrix} 0 & 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 & 1 \end{bmatrix}$$

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

2) Use elementary row operations to transform the augmented matrix to reduced echelon form. Then solve the system.

$$x_1 - 4x_2 - 3x_3 - 3x_4 = 4$$

$$2x_1 - 6x_2 - 5x_3 - 5x_4 = 5$$

$$3x_1 - x_2 - 4x_3 - 5x_4 = -7$$

$$\left[ \begin{array}{cccc|c} 1 & -4 & -3 & -3 & 4 \\ 2 & -6 & -5 & -5 & 5 \\ 3 & -1 & -4 & -5 & -7 \end{array} \right] \xrightarrow{\substack{(-2)R_1 + R_2 \\ (-3)R_1 + R_3}} \left[ \begin{array}{cccc|c} 1 & -4 & -3 & -3 & 4 \\ 0 & 2 & 1 & 1 & -3 \\ 0 & 11 & 5 & 4 & -19 \end{array} \right] \xrightarrow{\frac{1}{2}R_2}$$

$$\left[ \begin{array}{cccc|c} 1 & -4 & -3 & -3 & 4 \\ 0 & 1 & \frac{1}{2} & \frac{1}{2} & -\frac{3}{2} \\ 0 & 11 & 5 & 4 & -19 \end{array} \right] \xrightarrow{(-11)R_2 + R_3} \left[ \begin{array}{cccc|c} 1 & -4 & -3 & -3 & 4 \\ 0 & 1 & \frac{1}{2} & \frac{1}{2} & -\frac{3}{2} \\ 0 & 0 & -\frac{1}{2} & -\frac{3}{2} & -\frac{5}{2} \end{array} \right]$$

$$\xrightarrow{(-2)R_3} \left[ \begin{array}{cccc|c} 1 & -4 & -3 & -3 & 4 \\ 0 & 1 & \frac{1}{2} & \frac{1}{2} & -\frac{3}{2} \\ 0 & 0 & 1 & 3 & 5 \end{array} \right] \xrightarrow{\substack{(-\frac{1}{2})R_3 + R_2 \\ 3R_3 + R_1}} \left[ \begin{array}{cccc|c} 1 & -4 & 0 & 6 & 19 \\ 0 & 1 & 0 & -1 & -4 \\ 0 & 0 & 1 & 3 & 5 \end{array} \right]$$

$$\xrightarrow{4R_2 + R_1} \left[ \begin{array}{cccc|c} 1 & 0 & 0 & 2 & 3 \\ 0 & 1 & 0 & -1 & -4 \\ 0 & 0 & 1 & 3 & 5 \end{array} \right] \Rightarrow$$

Free variable  $x_4 = s$ 

$$x_1 = 3 - 2x_4$$

$$x_2 = -4 + x_4$$

$$x_3 = 5 - 3x_4$$

$$\Rightarrow \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} 3 - 2s \\ -4 + s \\ 5 - 3s \\ s \end{bmatrix} \quad \text{where } s \text{ is any real number}$$