Name: Scl ID #:

Show your work. Fill in the appropriate blanks

$x_1 + 2x_2 + x_4 = 0$

$x_3 + 5x_4 = 0$

A set of 4 vectors (a1 a2 a3 a4) row reduces to $\begin{pmatrix} 1 & 2 & 0 & 1 \\ 0 & 0 & \boxed{1} & 5 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{pmatrix}$

Q1) Circle pivot columns and put a box around pivot entries.

Q2) Are the vectors LI? NO

Q3) The pivot variables are $x_1 \quad x_3$

Q4) The free variables are $x_2 \quad x_4$

Q5) Write down a formula for all solutions to Ax = 0.

$$x = \begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ \; \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ 0 \\ 0 \\ \; \end{pmatrix} + \boxed{x_2} \begin{pmatrix} -2 \\ 1 \\ 0 \\ -1 \\ \; \end{pmatrix} + \boxed{x_4} \begin{pmatrix} 0 \\ 0 \\ -5 \\ 1 \\ \; \end{pmatrix} + \boxed{} \begin{pmatrix} \; \\ \; \\ \; \\ \; \\ \; \end{pmatrix} + \boxed{} \begin{pmatrix} \; \\ \; \\ \; \\ \; \\ \; \end{pmatrix}$$

Q6) Fill in any pivot columns. $\begin{pmatrix} \\ a_1 \\ \\ \end{pmatrix}, \begin{pmatrix} \\ a_3 \\ \\ \end{pmatrix}, \begin{pmatrix} \\ \\ \\ \end{pmatrix}, \begin{pmatrix} \\ \\ \\ \end{pmatrix}$

Q7) Write down two different non-trivial solutions to Ax = 0. $\begin{pmatrix} -2 \\ 1 \\ 0 \\ -1 \\ \\ \end{pmatrix}, \begin{pmatrix} 0 \\ 0 \\ -5 \\ 1 \\ \\ \end{pmatrix}$

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The AM of (a1 a2 a3 a4 b) for Ax = b row reduces to

$$\begin{pmatrix} \boxed{1} & 2 & 0 & 1 & 1 \\ 0 & 0 & \boxed{1} & 5 & 2 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

Incomsistent

$x_1 + 2x_2 + x_4 = 0$

$x_3 + 5x_4 = 0$

Q1) Circle pivot columns and put a box around pivot entries.

Q2) Are the vectors (a1 a2 a3 a4) LI? NO

Q3) The pivot variables are x_1 x_3

Q4) The free variables are x_2 x_4

Q5) Write down a formula for all solutions to Ax = b.

$$x = \begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} \text{No Soln} \end{pmatrix} + \square \begin{pmatrix} \\ \end{pmatrix} + \square \begin{pmatrix} \\ \end{pmatrix} + \square \begin{pmatrix} \\ \end{pmatrix} + \square \begin{pmatrix} \\ \end{pmatrix}$$

Q6) Fill in any pivot columns. $\begin{pmatrix} a_1 \end{pmatrix}, \begin{pmatrix} a_3 \end{pmatrix}, \begin{pmatrix} \; \end{pmatrix}$

Q7) Write down two different non-trivial solutions to Ax = 0. $\begin{pmatrix} -2 \\ 1 \\ 0 \\ 0 \end{pmatrix}, \begin{pmatrix} -1 \\ 0 \\ -5 \\ 1 \end{pmatrix}$

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Show your work. Fill in the appropriate blanks

Q1) Explain how to invert a square matrix A.

Row Reduce $(A \mid I) \sim (I \mid A^{-1})$
if A is invertible. Read of A^{-1}

Q2) If the matrix $\begin{pmatrix} 0 & 0 & 1 \\ 0 & 1 & 2 \\ 2 & 4 & 8 \end{pmatrix}$ is invertible complete

$$A^{-1} = \begin{pmatrix} 0 & -2 & \frac{1}{2} \\ -2 & 1 & 0 \\ 1 & 0 & 0 \end{pmatrix}$$

write DNE in the splace for the matrix in the inverse does Not Exist!

In[2]:= **Inverse**$\left[\begin{pmatrix} 0 & 0 & 1 \\ 0 & 1 & 2 \\ 2 & 4 & 8 \end{pmatrix}\right]$ **// MatrixForm**

Out[2]//MatrixForm=

$$\begin{pmatrix} 0 & -2 & \frac{1}{2} \\ -2 & 1 & 0 \\ 1 & 0 & 0 \end{pmatrix}$$

$$\left(\begin{array}{ccc|ccc} 0 & 0 & 1 & 1 & 0 & 0 \\ 0 & 1 & 2 & 0 & 1 & 0 \\ 2 & 4 & 8 & 0 & 0 & 1 \end{array}\right) \sim \left(\begin{array}{ccc|ccc} 2 & 4 & 8 & 0 & 0 & 1 \\ 0 & 1 & 2 & 0 & 1 & 0 \\ 0 & 0 & 1 & 1 & 0 & 0 \end{array}\right)$$

$$\sim \left(\begin{array}{ccc|ccc} 2 & 4 & 8 & 0 & 0 & 1 \\ 0 & 1 & 0 & -2 & 1 & 0 \\ 0 & 0 & 1 & 1 & 0 & 0 \end{array}\right) \sim \left(\begin{array}{ccc|ccc} 2 & 4 & 0 & -8 & 0 & 1 \\ 0 & 1 & 0 & -2 & 1 & 0 \\ 0 & 0 & 1 & 1 & 0 & 0 \end{array}\right)$$

$$\sim \left(\begin{array}{ccc|ccc} 2 & 0 & 0 & 0 & -4 & 1 \\ 0 & 1 & 0 & -2 & 1 & 0 \\ 0 & 0 & 1 & 1 & 0 & 0 \end{array}\right) \sim \left(\begin{array}{ccc|ccc} 1 & 0 & 0 & 0 & -2 & \frac{1}{2} \\ 0 & 1 & 0 & -2 & 1 & 0 \\ 0 & 0 & 1 & 1 & 0 & 0 \end{array}\right)$$