

Name: _____

ID #: _____

Show your work. Fill in the appropriate blanks

A set of 4 vectors (a1 a2 a3 a4 a5 a6 b) row reduces to

$$\begin{pmatrix}
 \boxed{1} & 0 & 1 & 0 & 6 & 0 & 1 \\
 0 & \boxed{1} & 2 & 0 & 1 & 0 & 5 \\
 0 & 0 & 0 & \boxed{1} & -3 & 0 & -4 \\
 0 & 0 & 0 & 0 & 0 & \boxed{1} & 3 \\
 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 0 & 0 & 0 & 0 & 0 & 0 & 0
 \end{pmatrix}$$

$$x_1 = 1 - x_3 - 6x_5$$

$$x_2 = 5 - 2x_3 - 1x_5$$

$$x_3 \text{ free}$$

$$x_4 = -4 + 3x_5$$

$$x_5 \text{ free}$$

$$x_6 = 3$$

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

Q2) Are the vectors (a1 a2 a3 a4 a5 a6) LI?

NO

Q3) The pivot variables are

1, 2, 4, 6

Q4) The free variables are

3, 5

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

$$x = \begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \\ x_6 \end{pmatrix} = \begin{pmatrix} 1 \\ 5 \\ 0 \\ -4 \\ 0 \\ 3 \end{pmatrix} + \boxed{x_3} \begin{pmatrix} -1 \\ -2 \\ 1 \\ 0 \\ 0 \\ 0 \end{pmatrix} + \boxed{x_5} \begin{pmatrix} -6 \\ -1 \\ 0 \\ 3 \\ 1 \\ 0 \end{pmatrix} + \boxed{} \begin{pmatrix} \\ \\ \\ \\ \\ \end{pmatrix} + \boxed{} \begin{pmatrix} \\ \\ \\ \\ \\ \end{pmatrix}$$

Q6) Fill in any pivot columns.

$$\begin{pmatrix} | \\ | \\ | \\ | \\ | \\ | \end{pmatrix} a_1, \begin{pmatrix} | \\ | \\ | \\ | \\ | \\ | \end{pmatrix} a_2, \begin{pmatrix} | \\ | \\ | \\ | \\ | \\ | \end{pmatrix} a_4, \begin{pmatrix} | \\ | \\ | \\ | \\ | \\ | \end{pmatrix} a_6, \begin{pmatrix} | \\ | \\ | \\ | \\ | \\ | \end{pmatrix}, \begin{pmatrix} | \\ | \\ | \\ | \\ | \\ | \end{pmatrix}$$

Q7) Write down two different non-trivial solutions to $Ax = 0$.

$$\begin{pmatrix} -1 \\ -2 \\ 1 \\ 0 \\ 0 \\ 0 \end{pmatrix}, \begin{pmatrix} -6 \\ -7 \\ 0 \\ 3 \\ 1 \\ 0 \end{pmatrix}$$

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A set of 4 vectors (a1 a2 a3 a4 a5 a6 b) row reduces to

$$\begin{pmatrix}
 \boxed{1} & 0 & -5 & 0 & 0 & 3 & 0 \\
 0 & \boxed{1} & 7 & 0 & 0 & 2 & 0 \\
 0 & 0 & 0 & \boxed{1} & 0 & 1 & 0 \\
 0 & 0 & 0 & 0 & \boxed{1} & 1 & 0 \\
 0 & 0 & 0 & 0 & 0 & 0 & 1 \\
 0 & 0 & 0 & 0 & 0 & 0 & 0
 \end{pmatrix}$$

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$$x_1 = 5x_3 - 3x_6$$

$$x_2 = -7x_3 - 2x_6$$

$$x_3 \text{ free}$$

$$x_4 = -x_6$$

$$x_5 = -x_6$$

7m $AX=0$

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

Q2) Are the vectors (a1 a2 a3 a4 a5 a6) LI?

NO

Q3) The pivot variables are

1, 2, 4, 5

Q4) The free variables are

3, 6

Q5) Write down a formula for all solutions to $Ax = 0$.note $AX=0!$

$$x = \begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \\ x_6 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix} + \boxed{x_3} \begin{pmatrix} 5 \\ -7 \\ 1 \\ 0 \\ 0 \\ 0 \end{pmatrix} + \boxed{x_6} \begin{pmatrix} -3 \\ -2 \\ 0 \\ -1 \\ -1 \\ 1 \end{pmatrix} + \cancel{\boxed{} \begin{pmatrix} \\ \\ \\ \\ \\ \end{pmatrix}} + \cancel{\boxed{} \begin{pmatrix} \\ \\ \\ \\ \\ \end{pmatrix}}$$

Q6) Fill in any pivot columns.

$$\begin{pmatrix} a_1 \\ \vdots \end{pmatrix}, \begin{pmatrix} a_2 \\ \vdots \end{pmatrix}, \begin{pmatrix} a_4 \\ \vdots \end{pmatrix}, \begin{pmatrix} a_5 \\ \vdots \end{pmatrix}, \begin{pmatrix} \vdots \end{pmatrix}, \begin{pmatrix} \vdots \end{pmatrix}$$

Q7) Write down two different non-trivial solutions to $Ax = 0$.

$$\begin{pmatrix} 5 \\ -7 \\ 1 \\ 0 \\ 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 2 \\ -2 \\ 0 \\ -1 \\ -1 \\ 1 \end{pmatrix}$$

Q8) Explain why $Ax = b$ has no solution.

No soln because
2nd last reduced eq

$0x_1 + 0x_2 + 0x_3 + 0x_4 + 0x_5 + 0x_6 = 1$
has no soln.
Hence system for $Ax = b$ is inconsistent