

Quiz 3 (12 am)

1. Find the solutions of the matrix equation $Ax = 0$ where A is the matrix below. For full credit you must write your answer in parametric vector form. (10 pts.)

$$A = \begin{bmatrix} 1 & 0 & -3 & 2 & 0 \\ -1 & 0 & 3 & -2 & 1 \\ 0 & 0 & 1 & 3 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix} \sim R_1+R_2 \begin{bmatrix} 1 & 0 & -3 & 2 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 3 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

$$R_3+R_1 \begin{bmatrix} 1 & 0 & 0 & 11 & 0 \\ 0 & 0 & 1 & 3 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

\swarrow x \swarrow y \swarrow z \swarrow u \swarrow v

So

$$x = -11r$$

$$y = s \text{ (free)}$$

$$z = -3r$$

$$u = r \text{ (free)}$$

$$v = 0$$

} parametric
equation
form of soln

$$X = \begin{pmatrix} x \\ y \\ z \\ u \\ v \end{pmatrix} = \boxed{\text{ANS.} \begin{bmatrix} -11 \\ 0 \\ -3 \\ 1 \\ 0 \end{bmatrix} r + s \begin{bmatrix} 0 \\ 1 \\ 0 \\ 0 \\ 0 \end{bmatrix}}$$

2. True or false. Assume the matrix A has 3 rows and 4 columns, so it's size is 3×4 , meaning the corresponding system has 3 equations and 4 unknowns. (2 pts. each)

(a) TRUE/FALSE If A has three pivot positions, then the equation $Ax = 0$ has the trivial solution.

(b) TRUE/FALSE If A has three pivot positions, then the equation $Ax = 0$ has a non-trivial solution.

(c) TRUE/FALSE If x is a nontrivial solution to $Ax = 0$, then every entry in x is nonzero.

(d) TRUE/FALSE If A has three pivot positions, then the equation $Ax = b$ is always consistent for all $b \in \mathbb{R}^3$.

(e) TRUE/FALSE The homogeneous system $Ax = 0$ has infinitely many solutions.