

NAME _____

Math 308E
Winter 2016

Midterm 1
January 29, 2016

Instructions

- Point totals for each problem are shown in parentheses.
- You must show all your work on the examination to receive credit. You must also use the techniques of this course on each problem; ask if you are not sure.
- Read each problem carefully. You will not receive credit if you misunderstand or misread a problem.
- Your work must be neat and organized.
- Be very careful with your arithmetic. None of the calculations or answers are too complicated.
- Make sure your test has 5 questions.

(6) 1. Find all solutions to the system of linear equations

$$x_1 + 2x_2 + x_3 = 7$$

$$-2x_1 - 4x_2 - x_3 = -9$$

$$-3x_1 - 6x_2 - x_3 = -11$$

- (6) 2. Let $\mathbf{u}_1 = (1, 2, 3)$ and $\mathbf{u}_2 = (-1, 2, 5)$ be vectors in \mathbf{R}^3 . For what value(s) of h is the vector $(h, 1, 4)$ in the span of $\{\mathbf{u}_1, \mathbf{u}_2\}$?

- (6) 3. Let $\mathbf{v}_1 = (2, 1, 2)$, $\mathbf{v}_2 = (3, -1, 1)$, and $\mathbf{v}_3 = (6, b, -2)$ be vectors in \mathbf{R}^3 . For what value(s) of b is the set $\{\mathbf{v}_1, \mathbf{v}_2, \mathbf{v}_3\}$ not linearly independent?

- (3) 4. Find a 3×3 matrix A such that the equation $A\mathbf{x} = \mathbf{0}$ has a unique solution but the equation

$$A\mathbf{x} = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$$

has no solution, or explain why such a matrix can't exist.

- (3) 5. Find distinct non-zero vectors \mathbf{u}_1 , \mathbf{u}_2 , and \mathbf{u}_3 such that \mathbf{u}_3 is not in the span of $\{\mathbf{u}_1, \mathbf{u}_2\}$ but that $\{\mathbf{u}_1, \mathbf{u}_2, \mathbf{u}_3\}$ is linearly dependent, or explain why such vectors cannot exist.