

Midterm 1

ⓘ This is a preview of the published version of the quiz

Started: Sep 17 at 7:38pm

Quiz Instructions

Once you open this quiz, you will have 75 minutes to submit it. You will have only **one** submission attempt. The quiz must be **submitted** by 7:59 PM (Atlanta time) on Friday, September 18. There are 20 questions after the honor code pledge.

This assessment is open-book and open-note, but not open-internet. You may use my class notes, your instructor's notes, and the ILA textbook at <https://textbooks.math.gatech.edu/ila/ila.pdf> (<https://textbooks.math.gatech.edu/ila/ila.pdf>).

However, you may not visit any other websites, use any search engines, or use any calculators or computer aids whatsoever (Interactive Row Reducer, Matlab, Mathematica, Chegg.com, Geogebra, etc.) as you take this assessment.

Question 1

0 pts

Please read and attest to the honor statement below:

I understand that this assessment is open-book and open-note, but not open-internet. I may use my class notes, my instructor's notes, and the ILA textbook at <https://textbooks.math.gatech.edu/ila/ila.pdf> (<https://textbooks.math.gatech.edu/ila/ila.pdf>).

However, I will not visit any other websites, use any search engines, or use any calculators or computer aids whatsoever (Interactive Row Reducer, Matlab, Mathematica, Chegg.com, Geogebra, etc.) as I take this assessment.

This assessment is completely my own work. I will not discuss the answers or any of the contents of this assessment with anyone until the time it is due.

- I attest to my integrity, and I understand that any suspected violation of this policy may be prosecuted to the fullest extent allowable by Georgia Tech.

Question 2

1 pts

Determine if each matrix is in row echelon form, reduced row echelon form, or neither. If the matrix is in reduced row echelon form, then the answer "row echelon form" is incorrect.

$$\begin{pmatrix} 0 \\ 1 \\ 0 \\ 0 \end{pmatrix} \quad \text{[Select]} \quad \downarrow$$

$$\left(\begin{array}{c|c} 1 & 0 \\ 0 & 2 \end{array} \right) \quad \text{[Select]} \quad \downarrow$$

$$\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} \quad \text{[Select]} \quad \downarrow$$

$$\begin{pmatrix} 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 \end{pmatrix} \quad \text{[Select]} \quad \downarrow$$

Question 3

1 pts

Find the value of h so that the solution set to the homogeneous matrix equation $Ax = 0$ is a line in \mathbb{R}^3 .

$$A = \begin{pmatrix} 1 & 1 & 3 \\ 0 & 2 & 0 \\ 1 & 3 & h \end{pmatrix}$$

Question 4

1 pts

Suppose that the augmented matrix for the matrix equation $Ax = b$ has reduced row echelon form

$$\left(\begin{array}{ccc|c} 1 & 3 & 0 & -2 \\ 0 & 0 & 1 & 4 \end{array} \right)$$

Fill in the parametric vector form of the solution set. Make sure to pay attention to which box corresponds to which letter.

$$\begin{pmatrix} A \\ B \\ C \end{pmatrix} + x_2 \begin{pmatrix} D \\ E \\ F \end{pmatrix}$$

A= D=

B= E=

C= F=

Question 5

1 pts

Answer both of the following true/false questions.

(a) If the set of solutions to $Ax = b$ is a line, then the set of solutions to $Ax = 0$ must also be a line.

(b) If $Ax = b$ is inconsistent, then $Ax = 0$ must also be inconsistent.

Question 6

1 pts

Find the value of h for which the following set of vectors is *not* linearly independent.

$$\left\{ \begin{pmatrix} 1 \\ 2 \\ 1 \end{pmatrix}, \begin{pmatrix} 1 \\ h \\ 1 \end{pmatrix}, \begin{pmatrix} 0 \\ 1 \\ 1 \end{pmatrix} \right\}$$

$h =$

Question 7

1 pts

Answer the following three true/false questions about 5×7 matrices.

(a) There is a 5×7 matrix with linearly independent columns.

[Select]

(b) If A is a 5×7 matrix, then at least 2 vectors are required to span the solution set for $Ax = 0$.

(c) There is a 5×7 matrix A so that $Ax = b$ is consistent for every b in \mathbb{R}^5 .

[Select]

Question 8

1 pts

Consider the following vector equation.

$$x \begin{pmatrix} 1 \\ 3 \end{pmatrix} + y \begin{pmatrix} 1 \\ -2 \end{pmatrix} + z \begin{pmatrix} 0 \\ 1 \end{pmatrix} = \begin{pmatrix} 1 \\ 1 \end{pmatrix}$$

Which of the following is a correct statement about the given vector equation?

- It has no solution
- It has infinitely many solutions
- It has exactly one solution
- The span of $\left\{ \begin{pmatrix} 1 \\ 3 \end{pmatrix}, \begin{pmatrix} 1 \\ -2 \end{pmatrix}, \begin{pmatrix} 0 \\ 1 \end{pmatrix} \right\}$ is a line

Question 9

1 pts

The set of solutions to a vector equation is always equal to a span.

- True
- False

Question 10

1 pts

Which of the following matrices have the property that their columns span \mathbb{R}^3 ? Select all that apply.

$\begin{pmatrix} 1 & 2 & 3 & 4 \\ 2 & 3 & 3 & 5 \\ 3 & 5 & 6 & 9 \end{pmatrix}$

$$\begin{pmatrix} 1 & 0 & 0 \\ 18 & 2 & 0 \\ 20 & 1 & 12 \end{pmatrix}$$

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

$$\begin{pmatrix} 3 & 1 & 1 \\ 4 & 4 & 22 \\ 0 & 10 & 1 \\ 1 & 0 & 1 \end{pmatrix}$$

Question 11**1 pts**

Suppose we have three equations in three variables. Which of the following can be the set of solutions? Select all that apply.

 A point A plane A line No solution**Question 12****1 pts**

Consider the following system of equations.

$$x + y = 3$$

$$y = 1$$

Which of the following (x,y) pairs are solutions to the system? Select all that apply.

(1,2) (2,1) (3,0) None of these**Question 13****1 pts**

Which of the following best describes the solution set of the following system of linear equations?

$$x + y = 2$$

$$z = 1$$

 a line in \mathbb{R}^3 a plane in \mathbb{R}^3 a point in \mathbb{R}^3 the empty set (no solution)**Question 14****1 pts**

Recall that the general equation for a circle is

$$A(x^2 + y^2) + Bx + Cy + D = 0$$

Find an equation for the circle passing through the points $(0,0)$, $(1,-1)$, and $(0,-7)$, where $A=1$. Your answer will be of the form

$$(x^2 + y^2) + Bx + Cy + D = 0$$

What are B, C, and D? Your answers should be numbers.

B= , C= , D=

Question 15**1 pts**

Fill in the entries of an augmented matrix in reduced row echelon form that represents a system of 3 equations in 2 variables, and whose solution set is the line $y = -3x$ in \mathbb{R}^2 .

<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>

(Due to limitations of Canvas, you will need to imagine the left and right parentheses and the vertical line between the last two columns.)

Question 16**1 pts**

Every set of 5 vectors in \mathbb{R}^7 is linearly independent.

True

False

Question 17**1 pts**

Which of the following statements is equivalent to the statement that the columns of A are linearly independent? Select all that apply.

- A has a pivot in each column
- $Ax = 0$ has only the zero solution
- No two columns of A are equal
- No two columns of A are multiples of each other

Question 18

1 pts

For each system of equations, indicate how many free variables there are in the set of solutions. You should assume that the number of variables in each system is the same as the largest subscript in that system.

$$\{ x_1 - x_2 + 8x_3 = -6 \quad [\text{Select}] \quad \downarrow$$

$$\begin{cases} x_1 + 3x_2 & = 7 \\ & x_3 - x_4 & = 0 \\ & & x_5 & = 5 \end{cases} \quad [\text{Select}] \quad \downarrow$$

$$\begin{cases} x_1 - x_2 & - 5x_6 & = 0 \\ & x_3 + x_4 & = 0 \\ & & x_5 & = 0 \end{cases} \quad [\text{Select}] \quad \downarrow$$

Question 19

1 pts

Suppose that a system of equations has the following row reduced augmented matrix:

$$\left(\begin{array}{cccc|c} 1 & -2 & 0 & -5 & 0 \\ 0 & 0 & 1 & 1 & 0 \end{array} \right)$$

Fill in the parametric form of the solution set

$$x_1 = \boxed{} x_2 + \boxed{} x_4$$

$$x_2 = \boxed{} x_2 + \boxed{} x_4$$

$$x_3 = \boxed{} x_2 + \boxed{} x_4$$

$$x_4 = \boxed{} x_2 + \boxed{} x_4$$

Question 20

1 pts

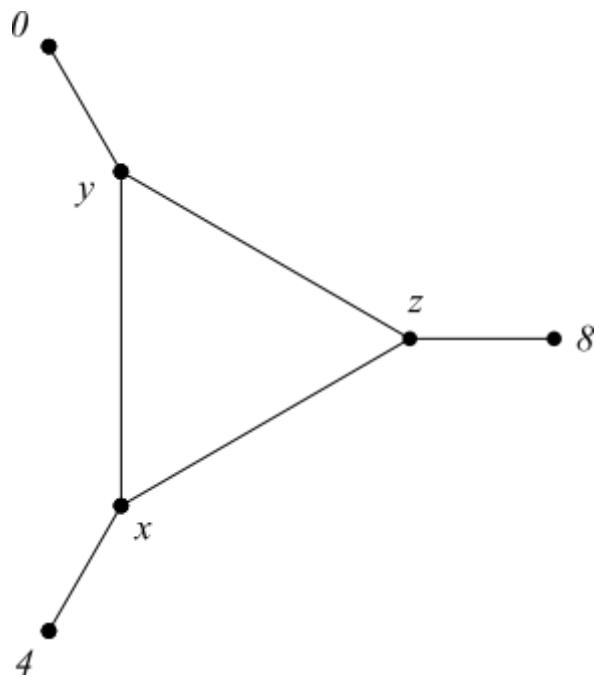
Suppose that the set of solutions to $Ax = b$ is the plane $z = 1$ in \mathbb{R}^3 . Which of the following is the set of solutions to $Ax = 0$?

- the x-axis in \mathbb{R}^3
- the z-axis in \mathbb{R}^3
- the xy-plane in \mathbb{R}^3
- (0,0,0)

Question 21

1 pts

Consider the following grid of wires and nodes.



Assuming that the temperatures at the nodes x , y , and z are the averages of the temperatures of the three nearest nodes, determine the temperatures at these nodes.

$x =$ $y =$ $z =$

Not saved

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