MA 2071 - *Matrices & Linear Algebra I* C-term Spring 2020
Sections C01 - C09

Date: February 5, 2020

Name: ______________________________

Quiz 3

Use of the textbook or notes is not allowed. No electronic devices or calculators are allowed. To get credit, you must show **ALL** of your work, unless otherwise stated in the problem. Please do not cheat. *"The first and worst of all frauds is to cheat one's self."*

Read each question carefully and follow the directions stated in each question.

1. Suppose $T : \mathbb{R}^n \to \mathbb{R}^m$ is a linear transformation given by $T(\vec{x}) = A\vec{x}$, where $A = \begin{bmatrix} 1 & 2 & 4 & 0 \\ -1 & 3 & 1 & 0 \\ -2 & 1 & 1 & 0 \end{bmatrix}$.

   (a) (1 point) What values must n and m take? Justify your answer. $n = 4$ since A has 4 columns, and $m = 3$ since A has 3 rows.

   (b) (6 points) Using A, determine whether or not T is (i) onto and (ii) one-to-one. Justify your answer. Row reducing A shows that there is a pivot in every row, so T is onto. There is not a pivot in every column, so T is not one-to-one.

2. (3 points)Suppose $T : \mathbb{R}^3 \to \mathbb{R}^3$ is a linear transformation such that $T\left(\begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}\right) = \begin{bmatrix} x_3 \\ x_2 \\ x_1 \end{bmatrix}$. Find the matrix A such that $T(\vec{x}) = A\vec{x}$. *Hint: Start with the identity matrix.* $A = \begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$

Date: February 5, 2020

Name: ____________________________

Quiz 3

Use of the textbook or notes is not allowed. No electronic devices or calculators are allowed. To get credit, you must show **ALL** of your work, unless otherwise stated in the problem. Please do not cheat. *"The first and worst of all frauds is to cheat one's self."*

Read each question carefully and follow the directions stated in each question.

1. Suppose $T : \mathbb{R}^n \to \mathbb{R}^m$ is a linear transformation given by $T(\vec{x}) = A\vec{x}$, where $A = \begin{bmatrix} -1 & 1 & -1 \\ -2 & 1 & 1 \\ 2 & -2 & 2 \end{bmatrix}$.

   (a) (1 point) What values must n and m take? Justify your answer. $n = 3$ since A has 3 columns. $m = 3$ since A has 3 rows.

   (b) (6 points) Using A, determine whether or not T is (i) onto and (ii) one-to-one. Justify your answer. Row reducing A shows that A does not have a pivot in every row, so T is not onto. Also, A does not have a pivot in every column, so T is not one-to-one.

2. (3 points) Suppose $T : \mathbb{R}^4 \to \mathbb{R}^4$ is a linear transformation such that $T\left(\begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix}\right) = \begin{bmatrix} x_1 \\ -\frac{5}{2}x_2 \\ x_3 \\ x_4 \end{bmatrix}$. Find the matrix A such that $T(\vec{x}) = A\vec{x}$. *Hint: Start with the identity matrix.* $A = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & -\frac{5}{2} & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

Date: February 5, 2020

Name: ____________________________

Quiz 3

Use of the textbook or notes is not allowed. No electronic devices or calculators are allowed. To get credit, you must show **ALL** of your work, unless otherwise stated in the problem. Please do not cheat. *"The first and worst of all frauds is to cheat one's self."*

Read each question carefully and follow the directions stated in each question.

1. Suppose $T : \mathbb{R}^n \to \mathbb{R}^m$ is a linear transformation given by $T(\vec{x}) = A\vec{x}$, where $A = \begin{bmatrix} 1 & 1 & 1 \\ 2 & -1 & 1 \\ 2 & 0 & 2 \\ 2 & 1 & 2 \end{bmatrix}$.

   (a) (1 point) What values must n and m take? Justify your answer. $n = 3$ since A has 3 columns, $m = 4$ since A has 4 rows.

   (b) (6 points) Using A, determine whether or not T is (i) onto and (ii) one-to-one. Justify your answer. Row reducing A shows that there will be a pivot in every column, so T is one-to-one. But there is not a pivot in every row, so T is not onto.

2. (3 points) Suppose $T : \mathbb{R}^2 \to \mathbb{R}^2$ is a linear transformation such that $T\left(\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}\right) = \begin{bmatrix} x_1 - 2x_2 \\ x_2 \end{bmatrix}$. Find the matrix A such that $T(\vec{x}) = A\vec{x}$. *Hint: Start with the identity matrix.* $A = \begin{bmatrix} 1 & -2 \\ 0 & 1 \end{bmatrix}$