

Name key

# Mathematics 1553

Quiz 5

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1. Complete the following definition: A function  $f: \mathbb{R}^n \rightarrow \mathbb{R}^m$  is one-to-one if...

... for every vector  $b$  in  $\mathbb{R}^m$ , the equation  $f(x) = b$  has at most one solution  $x$  in  $\mathbb{R}^n$ .

2. Consider the following linear transformations of  $\mathbb{R}^2$ . Below the description of each linear transformation, select all responses that apply.

(a) Clockwise rotation by  $2\pi/5$ .

ONE-TO-ONE

ONTO

NEITHER

(b) Projection to the  $x$ -axis.

ONE-TO-ONE

ONTO

NEITHER

Turn the page over!

2. Consider the following functions. Determine whether or not they are linear transformations. If so, give the matrix. If not, briefly explain why not.

The function  $T : \mathbb{R}^1 \rightarrow \mathbb{R}^1$  given by  $T(x) = (x + 1)$ .

No.  $T(0) = 0 + 1 \neq 0$ .

The function  $U : \mathbb{R}^3 \rightarrow \mathbb{R}^2$  given by  $U \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} y - x \\ 0 \end{pmatrix}$

Yes.  $A = \begin{pmatrix} -1 & 1 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

The function  $V : \mathbb{R}^3 \rightarrow \mathbb{R}^3$  given by projection to the  $yz$ -plane.

Yes.  $A = \begin{pmatrix} 0 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$