Name SOLUTIONS

Mathematics 1553

Quiz 4

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Section G1/Arjun G2/Talha G3/Athreya G4/Olivia G5/James (circle one!)

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1. Complete the following definition: *A basis for a subspace V of $\mathbb{R}^n$ is...*

a set of linearly independent vectors that span V.

2. Let A be the matrix

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

and let T be the corresponding matrix transformation.

Compute $T(v)$ where $v = \begin{pmatrix} 5 \\ 7 \end{pmatrix}$

$$\begin{pmatrix} 5 \\ 7 \\ 5 \end{pmatrix}$$

Find a vector in the codomain of T that is not in the range of T.

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

Turn the page!

3. Let A be the matrix

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

Find a basis for the column space of A.

$$\left\{\begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}\right\}$$

Find a basis for the null space of A.

$$\rightsquigarrow \begin{pmatrix} 1 & 1 & 1 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \rightsquigarrow x+y+z=0$$

$$\rightsquigarrow \begin{aligned} x &= -y-z \\ y &= y \\ z &= z \end{aligned} \rightsquigarrow y\begin{pmatrix} -1 \\ 1 \\ 0 \end{pmatrix} + z\begin{pmatrix} -1 \\ 0 \\ 1 \end{pmatrix}$$

$$\rightsquigarrow \left\{\begin{pmatrix} -1 \\ 1 \\ 0 \end{pmatrix}, \begin{pmatrix} -1 \\ 0 \\ 1 \end{pmatrix}\right\}$$

What is the dimension of the null space of A?

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