MATH221

quiz #2, 10/13/15

Total 100

Solutions

Show all work legibly. **Name**:_____

1. (20) Let $\mathbf{v}_1 = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$, $\mathbf{v}_2 = \begin{bmatrix} 4 \\ 5 \\ 6 \end{bmatrix}$, and $\mathbf{v}_3 = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$. True or False? The vectors are linearly independent.

   Mark one and explain.

   ▫ True ▫ False

2. (20) Let $T : \mathbf{R}^3 \to \mathbf{R}^1$ be a linear transformation such that $T\left(\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}\right) = 1$, $T\left(\begin{bmatrix} 4 \\ 5 \\ 6 \end{bmatrix}\right) = 2$, and $T\left(\begin{bmatrix} 7 \\ 8 \\ 9 \end{bmatrix}\right) = 3$. Find $T\left(\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}\right)$.

$T\left(\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}\right) =$

3. (40) Let T be a linear transformation that leaves $\mathbf{e}_1$ unchanged and maps $\mathbf{e}_2$ to $\mathbf{e}_2 - \mathbf{e}_1$.

   - (10) Find the standard matrix A of the linear transformation T.

$A =$

- (10) True or False? T is a one to one transformation.

Mark one and explain.

☐ True ☐ False

- (10) True or False? T is an onto transformation.

Mark one and explain.

☐ True ☐ False

- (10) If possible define the linear transformation S so that $S(T(\mathbf{x})) = \mathbf{x}$ for each $\mathbf{x} \in \mathbf{R}^2$ and find the standard matrix B of S.

$S(\mathbf{x}) =$ $B =$

4. (20) Suppose A is invertible and E_1, E_2, and E_3 are elementary matrices that reduce A to the identity matrix, i.e. $E_3E_2E_1A = I$. Use E_i and E_i^{-1} to produce elementary matrices that reduce A^{-1} to I.

the elementary matrices that reduce A^{-1} to I are:

5. (20) Suppose A and B are $n \times n$ matrices. True or False? If AB is invertible, then B is also invertible.

Mark one and explain.

☐ True ☐ False