MATH221

Midterm #2, 02/31/16

Total 100

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

1. (25) Let $T : \mathbf{R}^1 \to \mathbf{R}^1$ be a linear transformation so that $T(2) = 4$. Compute $T(7)$.

$T(7) =$

2. (25) Suppose a linear transformation $T : \mathbf{R}^n \to \mathbf{R}^n$ has the property that $T(\mathbf{u}) = T(\mathbf{v})$ for some pair of distinct vectors $\mathbf{u}$ and $\mathbf{v}$. True or False? T maps $\mathbf{R}^n$ onto $\mathbf{R}^n$.

Mark one and explain.

▫ True ▫ False

3. (25) Define a transformation $T : \mathbf{P}_2 \to \mathbf{R}^2$ by $T(p) = \begin{bmatrix} p(1) \\ p(2) \end{bmatrix}$.

(a) (10) True or False? T is a linear transformation.

Mark one and explain.

□ True □ False

(b) (15) Identify all polynomials $\mathcal{P}$ in $\mathbf{P}_2$ that vanish under T, i.e.

$$\mathcal{P} = \{p \ : \ p \in \mathbf{P}_2 \text{ and } T(p) = 0\}.$$

$\mathcal{P} =$

4. (25) Let $\mathbf{v}_1, \ldots, \mathbf{v}_n$ be a linearly independent set of vectors in $\mathbf{R}^n$. True or False? The vectors $\mathbf{v}_1, \ldots, \mathbf{v}_n$ span $\mathbf{R}^n$.

Mark one and explain.

□ True □ False