

Math 285
Spring, 2009

Name _____

Homework #4

Due Thursday, May 7

No late papers accepted! No excuses!!

1. Let V be a real inner product space, and let \mathbf{u} be a fixed (nonzero) vector in V . Define $T: V \rightarrow \mathbb{R}$ by $T(\mathbf{v}) = \langle \mathbf{u}, \mathbf{v} \rangle$. Use properties of the inner product to show that T is a linear transformation.

2. Find Ker (T) and Rng (T). Also find dim[Ker(T)] and dim[Rng(T)] for

$T : R^3 \rightarrow R^3$ defined by $T(\mathbf{x}) = A\mathbf{x}$, where

$$A = \begin{bmatrix} 1 & -1 & 0 \\ 0 & 1 & 2 \\ 2 & -1 & 1 \end{bmatrix}$$

3. Consider the linear transformation $T: P_2 \rightarrow P_1$ defined by

$$T(ax^2 + bx + c) = (a + b)x + (b - c)x$$

where a, b, c are arbitrary real numbers. Determine $\text{Ker}(T)$, $\text{Rng}(T)$ and their dimensions.