

Math 320 Linear Algebra Assignment # 11

1. Let $T : P_2 \rightarrow \mathbb{R}^{2 \times 2}$ be defined by:

$$T(ax^2 + bx + c) = \begin{bmatrix} a+b & a \\ b & c \end{bmatrix}$$

You can assume without proof that T is linear. (Hint: Only the first problem should require much in the way of work, the rest can be solved from theorems in the class.)

- (a) Find a basis for $\ker(T)$.
 - (b) Find $\dim(\ker(T))$.
 - (c) Find $\dim(\operatorname{Rg}(T))$.
 - (d) Find a basis for $\operatorname{Rg}(T)$.
 - (e) Is T 1-1?
 - (f) Is T onto?
2. Let V and W be vector spaces with $\dim(V) = n$ and $\dim(W) = m$. Also $T : V \rightarrow W$ is a linear transformation. Determine which of the following statements are **always** true explain your answer.
- (a) If $m < n$ then T is not 1-1.
 - (b) If $m > n$ then T is not 1-1.
 - (c) If $m < n$ then T is not onto.
 - (d) If $m > n$ then T is not onto.