

## Math 320 Linear Algebra Assignment # 12

1. Each of the following you may assume are linear transformation. For each find a basis for both  $\text{Rg}(T)$  and  $\ker(T)$ .

(a)  $T : \mathbb{R}^{2 \times 2} \rightarrow \mathbb{R}^3$  defined by:

$$T \left( \begin{bmatrix} a & b \\ c & d \end{bmatrix} \right) = \begin{bmatrix} a + b \\ a - b \\ c \end{bmatrix}.$$

(b) Let  $T : P_2 \rightarrow \mathbb{R}^3$  defined by:

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

(c)  $T : \mathbb{R}^4 \rightarrow \mathbb{R}^2$  defined by  $T(\vec{v}) = A\vec{v}$  where:

$$A = \begin{bmatrix} 3 & 3 & 1 & 3 \\ 2 & 1 & 3 & 4 \end{bmatrix}$$

(d)  $T : P_2 \rightarrow \mathbb{R}$  defined by  $T(p(x)) = \int_0^1 p(x)$ .

(e)  $T : P_n \rightarrow P_n$  defined by  $T(p(x)) = p'(x)$ .