HW04

MATH 102, WINTER 2018

DUE WEDNESDAY, FEB 7

NAME:

1. Let $T : \mathcal{P}_3 \to \mathcal{P}_4$ defined by

$$T(p(t)) = (2 + 3t)p(t).$$

   a. Show that T is a linear transformation.
   b. Find the matrix A representing T with respect to the standard bases.

2. Which of these transformations is not linear? The input is $\boldsymbol{v} = \begin{bmatrix} v_1 \\ v_2 \end{bmatrix}$.

   a. $T(\boldsymbol{v}) = \begin{bmatrix} v_2 \\ v_1 \end{bmatrix}$
   b. $T(\boldsymbol{v}) = \begin{bmatrix} v_1 \\ v_1 \end{bmatrix}$
   c. $T(\boldsymbol{v}) = \begin{bmatrix} 0 \\ v_1 \end{bmatrix}$
   d. $T(\boldsymbol{v}) = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$

3. Show that $\boldsymbol{x} - \boldsymbol{y}$ is orthogonal to $\boldsymbol{x} + \boldsymbol{y}$ **if and only if** $\|\boldsymbol{x}\| = \|\boldsymbol{y}\|$.

4. Suppose S is spanned by the vectors $\begin{bmatrix} 1 \\ 2 \\ 2 \\ 3 \end{bmatrix}$ and $\begin{bmatrix} 1 \\ 3 \\ 3 \\ 2 \end{bmatrix}$. Find two vectors that span $S^{\perp}$. This is the same as solving $A\boldsymbol{x} = 0$ for which A?