Linear Algebra (Math 220)
Assignment due Thursday, April 17

1 Preparation

Expect a **quiz**.

Relevant Reading:

Course notes on "change of basis"[1] (also available as PDF[2])
Lay § 4.7
Hefferon § 3.V

2 Exercises

1. Let $\mathcal{P}_2$ denote the vector space of polynomials of degree 2 or less. If f is an element of $\mathcal{P}_2$, let T_f be the polynomial given by the formula

$$T_f(x) \ = \ \frac{d}{dx}(xf(x)) \quad .$$

   (a) Show that the function T that is defined by

$$T(f) \ = \ T_f$$

   is a linear map from $\mathcal{P}_2$ to $\mathcal{P}_2$.

   (b) What is the dimension of $\mathcal{P}_2$?

   (c) Find a basis of the kernel of T.

   (d) Find a basis of the image of T.

2. Let f be the linear function from $\mathbf{R}^3$ to $\mathbf{R}^3$ that has the matrix

$$D \ = \ \begin{pmatrix} 2 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 3 \end{pmatrix}$$

   relative to the basis of $\mathbf{R}^3$ given by the columns of the matrix

$$\begin{pmatrix} 3 & 6 & 2 \\ 2 & -3 & 6 \\ 6 & -2 & -3 \end{pmatrix} \quad .$$

   Find the matrix of f relative to the standard basis of $\mathbf{R}^3$.

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[1]URI: http://math.albany.edu/math/pers/hammond/course/mat220s2008/mab.xhtml
[2]URI: http://math.albany.edu/math/pers/hammond/course/mat220s2008/mab.pdf