LINEAR ALGEBRA
FALL 2013

PRACTICE 9.1

Exercise 1. Repeat Exercise 9.1.3 for the vector space

$$V = \{f(x)\cos(ax) + g(x)\sin(ax) \mid f(x), g(x) \in H\},$$

where $a \in \mathbb{R}$.

Exercise 2. Repeat Exercise 9.1.3 for the vector space

$$V = \{e^{bx}(f(x)\cos(ax) + g(x)\sin(ax)) \mid f(x), g(x) \in H\},$$

where $a, b \in \mathbb{R}$ (using an appropriate basis).

Exercise 3. Repeat Exercises 9.1.4-6 in the case $H = \mathbb{P}_4$ and $a \neq 0$ is arbitrary.

Exercise 4. Repeat exercises 9.1.4-6 for the vector space of Exercise 1, with $H = \mathbb{P}_2$. In this situation, it's useful to use two *different bases* (at least in terms of their ordering) for the matrix of the transformation. Try taking $\mathcal{B} = \{\cos ax, \sin ax, x\cos ax, x\sin ax, x^2\cos ax, x^2\sin ax\}$ and $\mathcal{C} = \{\sin ax, \cos ax, x\sin ax, x\cos ax, x^2\sin ax, x^2\cos ax\}$. You may want to try $a = 1$ as a (relatively) simple initial example.

Exercise 5. Repeat exercises 9.1.4-6 for the vector space of Exercise 2, with $H = \mathbb{P}_2$. As above, it may be useful to use two differently ordered bases for the matrix of the transformation, but you should decide what's optimal. You may want to try $a = b = 1$ as a (relatively) simple initial example.

Exercise 6. As in exercise 9.1.7, write down and evaluate some ostensibly "horrific" antiderivatives involving functions from the vector spaces in Exercises 1-3.