Exploration 3 **Math 347** **Spring 2013**
Deadline: 12N, Friday, 17 May

Writing

- Using *clear sentences*, incorporate symbols, calculations, and, above all, illustrations into the text. Have an audience in mind. *Explain* what you're doing and why you're doing it—that is, provide an *concise* and *coherent* arguments for what you're doing. You can collaborate with a partner—submit one group paper.
- *Ethic*: You may consult classmates and the instructor, but what you write should be *entirely your own work*.
- Typed work is appreciated. Hand-drawn figures are acceptable.

Reading

9.1-9.5, 10.1-10.4

Exercises

1) Suppose V has finite dimension $T : V \longrightarrow V$ is linear and satisfies

$$T^2 = T \qquad \text{(note: } T^2 = TT\text{).}$$

   a) Show that T is a *projection* in the sense that for some subspace $U \subset V$,

$$T|_U = I|_U \quad \text{and} \quad T(V) = U.$$

   We say that T projects V onto U.

   b) Determine the possible eigenvalues for T.
   c) Show that T has a basis of eigenvectors $\mathcal{E}$.
   d) Describe the form of the matrix $\widehat{T}_{\mathcal{E}}$ of T relative to $\mathcal{E}$.
   e) Work out the map $P : \mathbf{R}^3 \longrightarrow \mathbf{R}^3$ is projection onto the plane $y = z$?

2) **9.2:** 3
3) **9.3:** 3
4) **9.4:** 3
5) **10.1:** 6
6) **10.2:** 6
7) **10.4:** 1