**Name** ___________________________ Class Time _____

**Math 2250 Extra Credit Problems**
**Chapter 6**
**S2015**

**Submitted work**. Please submit one stapled package with this sheet on top. Kindly check-mark the problems submitted and label the paper **Extra Credit**. Label each solved problem with its corresponding problem number, e.g., Xc10.3-20.

### Problem Xc6.1-12. (Eigenpairs of a $2 \times 2$)

Let $A = \begin{pmatrix} 9 & -10 \\ 2 & 0 \end{pmatrix}$. Find the eigenpairs of $A$. Then report eigenpair packages $P$ and $D$ such that $AP = PD$.

### Problem Xc6.1-20. (Eigenpairs of a $3 \times 3$)

Let $A = \begin{pmatrix} 5 & -6 & 3 \\ 6 & -7 & 3 \\ 6 & -6 & 2 \end{pmatrix}$. Find the eigenpairs of $A$. Then report eigenpair packages $P$ and $D$ such that $AP = PD$.

### Problem Xc6.1-32. (Complex eigenpairs of a $2 \times 2$)

Let $A = \begin{pmatrix} 0 & -6 \\ 24 & 0 \end{pmatrix}$. Find the eigenpairs of $A$. Then report eigenpair packages $P$ and $D$ such that $AP = PD$.

### Problem Xc6.1-36. (Eigenvalues of band matrices)

Find the eigenvalues of the matrix $A$ below without the aid of computers.

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

### Problem Xc6.2-6. (Eigenpair packages of a $3 \times 3$)

Let $A = \begin{pmatrix} 2 & -2 & 1 \\ 2 & -2 & 1 \\ 2 & -2 & 1 \end{pmatrix}$. Find the eigenpairs of $A$. Then report eigenpair packages $P$ and $D$ such that $AP = PD$.
Check the answer by hand, expanding both products $AP$ and $PD$, finally showing equality.

### Problem Xc6.2-18. (Fourier's model for a $3 \times 3$)

Assume Fourier's model for a certain matrix $A$:

$$A\left(c_1\begin{pmatrix} 1 \\ 0 \\ -2 \end{pmatrix} + c_2\begin{pmatrix} 1 \\ 1 \\ 0 \end{pmatrix} + c_3\begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix}\right) = 3c_1\begin{pmatrix} 1 \\ 0 \\ -2 \end{pmatrix} + c_2\begin{pmatrix} 1 \\ 1 \\ 0 \end{pmatrix} + c_3\begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix}.$$

Find $A$ explicitly from $AP = PD$. Check your answer by finding the eigenpairs of $A$.

### Problem Xc6.2-28. (Eigenpairs and diagonalization of a $4 \times 4$)

Determine the eigenpairs of $A$ below. If diagonalizable, then report eigenpair packages $P$ and $D$ such that $AP = PD$.

$$A = \begin{pmatrix} 1 & 2 & 0 & 0 \\ 2 & 1 & 2 & 0 \\ 0 & 2 & 1 & 2 \\ 0 & 0 & 0 & 13 \end{pmatrix}$$

**End of extra credit problems chapter 6.**