

Math 2250 Extra Credit Problems
Chapter 6
S2014

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 2×2)

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 3×3)

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 2×2)

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 3×3)

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 3×3)

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 4×4)

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.