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Cover Sheet for 2013-2014 Spring Semester MATH 3210/5210 (Barsamian) Homework 9
(Due Monday, April 14, 2014. Staple this page to the front of your work.)

Problem:	1	2	3	4	5	Total	Rescaled
Your Score:							
Possible:	20	20	20	20	20	100	10

[1] (Five True False questions from suggested exercise 5.2#1.) The True/False answers for some of the questions are given in the back of the book. For each question, give the true/false answer and also explain why the answer is true or false. Justify your explanation by referring to things that the book says in Section 5.2

5.2#1(a) Any linear operator on an n-dimensional vector space that has fewer than n distinct eigenvalues is not diagonalizable.

5.2#1(c) If λ is an eigenvalue of a linear operator T, then each vector in E_λ is an eigenvector of T.

5.2#1(d) If λ_1, λ_2 are distinct eigenvalues of a linear operator T, then $E_{\lambda_1} \cap E_{\lambda_2} = \{0\}$

5.2#1(e) Let $A \in M_{n\times n}(F)$ and $\beta = \{v_1, v_2, \cdots, v_n\}$ be and ordered basis for F^n consisting of eigenvectors of A. If Q is the $n \times n$ matrix whose j^{th} column is v_j (for all $1 \leq j \leq n$), then $Q^{-1}AQ$ is a diagonal matrix.

5.2#1(f) A linear operator T on a finite-dimensional vector space is diagonalizable if and only if the multiplicity of each eigenvalue λ equals the dimension of E_λ.

For all of the problems below, you must show all details of the calculations. It would be a good idea to check your answers by using an online tool such as Wolfram Alpha. But remember that you must show all of the details that lead to the solution, and you should present the steps clearly. The idea is not to turn in scrap paper work, but rather to turn in clear steps that somebody else can read and understand.

For problems [2],[3],[4], you are given a matrix $A \in M_{n\times n}(R)$.

(a) Test matrix A for diagonalizability.

(b) If A is diagonalizable, then find an invertible matrix Q and a diagonal matrix D such that $Q^{-1}AQ = D$.

[2] Let $A = \begin{pmatrix} 1 & 0 \\ 2 & 1 \end{pmatrix} \in M_{2\times 2}(R)$.

[3] Let $A = \begin{pmatrix} 1 & 1 & 0 \\ 0 & 2 & 3 \\ 0 & 0 & 2 \end{pmatrix} \in M_{2\times 2}(R)$.

[4] Let $A = \begin{pmatrix} 1 & 2 \\ 4 & 3 \end{pmatrix} \in M_{2\times 2}(R)$.

[5] Let $A = \begin{pmatrix} 1 & 2 \\ 4 & 3 \end{pmatrix} \in M_{2\times 2}(R)$. Find an expression for A^n, where n is an arbitrary integer.