Name:

Math 254 Fall 2014 Exam 11

Please read the following directions:
Please print your name in the space provided, using large letters, as “First LAST”. Books, notes, calculators, and other aids are not permitted on this exam. Please write legibly, with plenty of white space. Please put your answers in the designated areas. Show all necessary work in your solutions; if you are unsure, show it. Cross out work you do not wish graded; incorrect work can lower your grade. All problems are worth 5-10 points; your total will be scaled to the standard 100 point scale. You have approximately 30 minutes.

Extra credit may be earned by handing in revised work in class on Wednesday 12/3; for details see the syllabus. You will find this exam on the instructor’s webpage later today.

1. Carefully state the definition of “nondegenerate span”. Give a set of vectors from $P_2(t)$ whose nondegenerate span does not include t.

2. Let $A \in M_{n,n}$. Suppose that u, v are two eigenvectors of A, both corresponding to the same eigenvalue λ. Prove that $u + v$ is also an eigenvector for A corresponding to λ.

3. Consider $A = \begin{pmatrix} 7 & 1 & 0 & 0 \\ 0 & 7 & 1 & 0 \\ 0 & 0 & 7 & 0 \\ 0 & 0 & 0 & 7 \end{pmatrix}$. Find all the eigenvalues of A, and for each give the algebraic and geometric multiplicities. Find the characteristic and minimal polynomials of A.

4. Suppose for matrix B we have found the characteristic and minimal polynomials as $\Delta_B(t) = (t-3)^2(t-5)^2$, $\min_B(t) = (t-3)^2(t-5)$. Give the Jordan canonical form for B.

5. Find all the eigenvalues and eigenspaces of $C = \begin{pmatrix} 2 & -3 & 4 \\ 0 & -1 & 3 \\ 0 & 0 & 2 \end{pmatrix}$.