Math 254-1 Exam 11: 12/8/8

Please read the exam instructions.

Notes, books, papers, calculators and electronic aids are all forbidden for this exam. Please write your answers on **the attached page only** (front and back if necessary). Indicate clearly what work goes with which problem. Cross out work you do not wish graded; incorrect work can lower your grade. You may use this first page as scratch paper; keep it for your records. Show all necessary work in your solutions; if you are unsure, show it. Extra credit may be earned by handing in revised work in class on Wednesday 12/10; for details see the syllabus. Each problem is worth 10 points; your total will be doubled to fit the standard 100 point scale. You have approximately 30 minutes.

1. Carefully define the term "basis". Give two examples in $\mathbb{R}^2$.

   For the remaining problems, consider the matrix $A = \begin{pmatrix} 2 & -1 & 1 \\ 0 & 3 & 0 \\ 1 & 0 & 2 \end{pmatrix}$.
   Hint: all solutions can be expressed with integers.

2. Calculate the characteristic polynomial $\Delta(t)$ (or $p(\lambda)$) for A.

3. Find all the eigenvalues of A.

4. For each eigenvalue, find a maximal independent set of eigenvectors.

5. For each eigenvalue, give its algebraic and geometric multiplicity. Is A diagonalizable? What is the Jordan form of A?

Please hand in ONLY the second page; keep this first page.

ID Code: ____________________

Please write all solutions on this page (front and back if necessary).