## Math 254 Exam 10: 12/5/6

Please read the exam instructions.
Notes, books, papers, calculators and electronic aids are all forbidden for this exam. Please write your answers on separate paper, indicate clearly what work goes with which problem, and put your name on every sheet. Cross out work you do not wish graded; incorrect work can lower your grade, even compared with no work at all. Keep this list of problems 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 Thursday 12/7; for details see the syllabus. Each problem is worth 10 points.

1. Carefully define the term "linear mapping (transformation)". Give two examples in $\mathbb{R}^{2}$.
For the next three problems, consider the matrix $A=\left[\begin{array}{ccc}2 & 1 & 3 \\ 1 & 1 & -1 \\ -1 & -2 & -3\end{array}\right]$.
2. Calculate $|A|$ by using the formula for $3 \times 3$ determinants.
3. Calculate $|A|$ by expanding on the second column.
4. Calculate $|A|$ by making $A$ triangular with elementary operations.
5. Calculate $|B|$, for $B=\left[\begin{array}{ccccc}1 & 2 & 3 & 4 & 0 \\ 1 & 0 & 2 & 0 & -2 \\ 0 & -1 & 2 & 5 & 0 \\ -2 & 0 & 0 & 2 & 3 \\ 3 & 0 & 1 & 0 & 1\end{array}\right]$.
