Math 254-2 Exam 5: 10/21/8
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 Thursday 10/23; for details see the syllabus. Each problem is worth 10 points; your total will be scaled to the standard 100 point scale. You have approximately 30 minutes.

1. Carefully state the definition of "basis". Give two examples from $\mathbb{R}^2$.

   Problems 2 and 3 both concern the matrix $A = \begin{pmatrix} 2 & -4 & 6 & 0 & 4 \\ 1 & -2 & 3 & 0 & 2 \\ -1 & 2 & -3 & 1 & -1 \\ -2 & 4 & -6 & 2 & -2 \\ 3 & -6 & 9 & -3 & 3 \end{pmatrix}$.

2. Set $S = Rowspace(A)$. Find a basis for S, and determine its dimension.

3. Set $T = Columnspace(A)$. Find a basis for T, and determine its dimension.

   Problems 4 and 5 both concern the vector spaces $A = Span\big((2, 0, 1), (1, -1, 3)\big)$ and $B = Span\big((5, 1, 0), (0, 4, -10)\big)$. Both are subspaces of $\mathbb{R}^3$.

4. Find a basis for $A + B$, and determine its dimension.

5. Find a basis for $A \cap B$, and determine its dimension.

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

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