

Math 254-1 Exam 5: 10/20/8

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 10/22; 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 state the definition of “basis”. Give two examples from \mathbb{R}^2 .

Problems 2 and 3 both concern the matrix $A = \begin{pmatrix} 1 & -2 & 1 & -1 & 1 \\ 2 & -4 & 3 & 0 & -1 \\ 1 & -2 & 0 & -3 & 4 \\ -1 & 2 & 1 & 5 & -7 \\ -2 & 4 & -4 & -2 & 4 \end{pmatrix}$.

2. Set $S = \text{Rowspace}(A)$. Find a basis for S , and determine its dimension.
3. Set $T = \text{Columnspace}(A)$. Find a basis for T , and determine its dimension.

Problems 4 and 5 both concern the vector spaces $A = \text{Span}((1, 2, 3), (-1, 1, 2))$ and $B = \text{Span}((5, 1, 0), (9, 0, -3))$. 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.

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