

Math 254-2 Exam 6: 10/28/8

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 10/30; 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 Linear Algebra term “independent”. Give two examples from \mathbb{R}^2 .
2. In the vector space $M_{2,3}$ of 2×3 matrices, set:
$$A = \begin{pmatrix} 3 & 2 & 4 \\ 1 & 0 & -1 \end{pmatrix}, B = \begin{pmatrix} 2 & 2 & 2 \\ 1 & -1 & -2 \end{pmatrix}, C = \begin{pmatrix} 11 & 4 & 18 \\ 2 & 5 & 3 \end{pmatrix}$$
Determine whether or not $\{A, B, C\}$ is independent.
3. In the vector space $\mathbb{R}_3[x]$ of polynomials of degree at most 3, set $u_1 = 4x^3 - 2x^2 + 3x + 1$, $u_2 = 5x^3 - 2x^2 + 7x + 2$, $u_3 = -2x^3 + 2x^2 + 5x + 1$, $u_4 = 5x^3 - 4x^2 + 6x + 2$.
Set $S = \text{span}\{u_1, u_2, u_3, u_4\}$. Find the dimension of S , and a basis.
4. In the vector space \mathbb{R}^2 , set $S = \{(1, 3), (1, 4)\}$, a basis. Find the change-of-basis matrix from the standard basis to S , and use this matrix to find $[(5, -3)]_S$.
5. In the vector space \mathbb{R}^3 , set $T = \{(1, 1, 1), (-1, 0, -2), (2, 1, 2)\}$, a basis. Find $[(1, 2, 3)]_T$.

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).