Math 254-1 Exam 6: 10/27/8

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 10/29; 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:

   $A = \begin{pmatrix} 1 & 2 & 3 \\ 4 & 0 & 5 \end{pmatrix}, B = \begin{pmatrix} 2 & 4 & 7 \\ 10 & 1 & 13 \end{pmatrix}, C = \begin{pmatrix} 1 & 2 & 5 \\ 8 & 2 & 11 \end{pmatrix}$

   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 $u_1 = x^3 + x^2 + 2x + 1, u_2 = x^3 - x^2 + x + 1, u_3 = x^3 + 5x^2 + 4x + 1, u_4 = x^3 + 2x^2 + 3x + 4$.

   Set $S = span\{u_1, u_2, u_3, u_4\}$. Find the dimension of S, and a basis.

4. In the vector space $\mathbb{R}^2$, set $S = \{(1, 1), (4, 5)\}$, 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 $T = \{(1, 1, 1), (0, 1, 2), (1, 1, 3)\}$, a basis. Find $[(1, 2, 2)]_T$.

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).