Proof R-2

Accepted **Not Accepted**

I affirm this work abides by the university's Academic Honesty Policy.

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Print Name, then Sign

- First due date **Thursday, December** 4.
- Turn in your work on a separate sheet of paper with this page stapled in front.
- Do not include scratch work in your submission.
- There is to be **no collaboration** on any aspect of developing and presenting your proof. Your only resources are: you, the course textbook, me, and pertinent discussions that occur **during class.**
- Follow the Writing Guidelines of the Grading Rubric.
  (http://math.ups.edu/~bryans/Current/Fall_2008/290inf_Fall2008.html#tth_sEc5.1)
- Retry: Only use material from the relevant section or earlier.
- Retry: Start over using a new sheet of paper.
- Retry: Restaple with new attempts first and this page on top.

The perplexity of life arises from there being too many interesting things in it for us to be interested properly in any of them. – G. K. Chesterton, 1909

R-2 (You may use material up through Section MR)
Consider the two linear transformations,

$$T : M_{22} \to P_2, \quad T\left(\begin{bmatrix} a & b \\ c & d \end{bmatrix}\right) = (2a - b + 3c + d) + (2b - c + 2d)\,x + (4a - 2b + 3c + d)\,x^2$$

$$S : P_2 \to \mathbf{C}^2, \quad S\left(\alpha + \beta x + \delta x^2\right) = \begin{bmatrix} 2\alpha + \beta - 3\delta \\ 5\alpha + 2\beta - 4\delta \end{bmatrix}$$

and the bases B, C, and D of M_{22}, P_2, and $\mathbf{C}^2$ (respectively)

$$B = \left\{\begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}, \begin{bmatrix} 3 & 2 \\ 1 & -4 \end{bmatrix}, \begin{bmatrix} 2 & 3 \\ 3 & -4 \end{bmatrix}, \begin{bmatrix} -2 & -4 \\ -5 & 4 \end{bmatrix}\right\}$$

$$C = \left\{1 + x,\ -2 - 3x + x^2,\ -2 - 2x + x^2\right\}$$

$$D = \left\{\begin{bmatrix} 2 \\ 5 \end{bmatrix}, \begin{bmatrix} 1 \\ 3 \end{bmatrix}\right\}$$

- Verify the conclusion of Theorem MRCLT. Specifically, explain how to build the three matrix representations of T, S and $S \circ T$ and check that they are related by the matrix product in the theorem.
