Practice Problems

MATH2055: Advanced Linear Algebra Tutorial 6
Midterm Review

Benjamin Fedoruk

Ontario Tech University

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Let β be any positive real number. Show that $\mathbb{R}$ is a real vector space, using addition $\oplus$ and scalar multiplication $\odot$.

$$x \oplus y = \beta xy$$

$$k \odot x = \beta^{k-1} x^k$$

What is span$\{A, B, C\}$?

$$A = \begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}, B = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}, C = \begin{bmatrix} 0 & 0 \\ 0 & 1 \end{bmatrix}$$

Is the following transformation linear?

$$T : \mathbb{R}^{\mathbb{R}} \to \mathbb{R}^2 \qquad T(f) = \begin{bmatrix} f(0) \\ f(1) + 1 \end{bmatrix}$$

Prove the Pythagorean Theorem for inner product spaces: Let v and u be orthogonal vectors. Then

$$||v + u||^2 = ||u||^2 + ||v||^2$$

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