## Practice Problems MATH2055: Advanced Linear Algebra Tutorial 6 Midterm Review

Benjamin Fedoruk

Ontario Tech University

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Benjamin Fedoruk (Ontario Tech University)

Practice Problems

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

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

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## Question 2 - Span of Three $2 \times 2$ Matrices

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

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

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## Is the following transformation linear?

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

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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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