

# Practice Problems

## MATH2055: Advanced Linear Algebra Tutorial 4 **Matrix Products and the Exponential**

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## Question 1 - Exponential of Sum is Product of Exponential

Prove that  $\exp(A + B) = \exp(A) \exp(B)$  if  $A$  and  $B$  commute. Does the property still hold if  $A$  and  $B$  do not commute?

## Question 2 - Kronecker Product Computation

Define the following matrices:

$$A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix}, B = \begin{bmatrix} 7 & 8 \\ 9 & 10 \end{bmatrix}$$

Compute  $A \otimes B$ .

## Question 3 - Schur Product Computation

Define the following matrices:

$$A = \begin{bmatrix} -1 & 3 & -5 & 1 & 3 \\ 1 & 4 & 0 & -2 & 0 \end{bmatrix}, B = \begin{bmatrix} 3 & -4 & 5 & 5 & 4 \\ -5 & -1 & 2 & -2 & -5 \end{bmatrix}$$

Compute  $A \circ B$ .

## Question 4 - Schur Product of Symmetric Matrices

Prove or give a counterexample: The Schur product of symmetric matrices is symmetric.

## Question 5 - Commutativity of Kronecker Product

Prove or give a counterexample: The Kronecker product is commutative.