SC1.310 Assignment 3

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Question 1.

Consider the map Λ :

$$\begin{pmatrix} \rho_{11} & \rho_{12} \\ \rho_{21} & \rho_{22} \end{pmatrix} \longrightarrow \begin{pmatrix} \rho_{22} & \rho_{12} \\ \rho_{21} & \rho_{11} \end{pmatrix}$$

Check the i)positivity and ii)complete positivity of this map Λ

Question 2.

Consider the matrix : $X = \begin{pmatrix} 1 & -1 & -1 \\ -1 & 1 & -1 \\ -1 & -1 & 1 \end{pmatrix}$
Check whether X is positive or not.

Question 3.

Consider the following $LGKS$ master equation for a qubit density matrix $\rho = \begin{pmatrix} \rho_{11} & \rho_{12} \\ \rho_{21} & \rho_{22} \end{pmatrix}$:

$$\frac{d\rho}{dt} = \gamma(\sigma_x \rho \sigma_x - \rho) + \gamma(\sigma_y \rho \sigma_y - \rho) + \gamma(\sigma_z \rho \sigma_z - \rho)$$

where $(\sigma_x, \sigma_y, \sigma_z)$ are the pauli matrices.
a) Solve this master equation
b) Derive the Kraus operator for this operation,
c) Check positivity and complete positivity of this operation.