Homework Problems on Matrix Exponentiation

1. In class we calculated $e^{tA}$ for the matrix

$$A = \begin{pmatrix} 2 & 1 \\ 0 & 2 \end{pmatrix}$$

by finding a pattern for the powers of $A$. Another way to calculate it involves writing $A = 2I + J$ where

$$J = \begin{pmatrix} 0 & 1 \\ 0 & 0 \end{pmatrix}.$$

Use the fact that

$$e^{tA} = e^{2tI} e^{tJ}$$

to calculate $e^{tA}$.

2. Calculate $e^{tA}$ where

$$A = \begin{pmatrix} 2 & 1 & 0 \\ 0 & 2 & 1 \\ 0 & 0 & 2 \end{pmatrix}.$$

3. Calculate $e^{tA}$ where

$$A = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}.$$