

1. (3 points) Solve $\frac{d\vec{u}}{dt} = A\vec{u}$ if $A = \begin{bmatrix} 5 & 4 \\ -1 & 1 \end{bmatrix}$.

2. (3 points) Compute e^{At} if $A = \begin{bmatrix} 1 & 1 \\ 4 & -2 \end{bmatrix}$.

3. (4 points) Find the general solution for $\frac{d\vec{u}}{dt} = \begin{bmatrix} 1 & 1 \\ 4 & -2 \end{bmatrix} \vec{u} + \begin{bmatrix} 2 - 3t \\ -8t - 8 \end{bmatrix}$. Hint: I suspect variation of parameters will be the best method.