

YOUR NAME: _____

George Voutsadakis

Read each problem **very carefully** before starting to solve it. Each problem is worth 3 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

1. Let $\mathbf{x} = \begin{pmatrix} 1 - 2i \\ i \\ 2 \end{pmatrix}$, $\mathbf{y} = \begin{pmatrix} 2 \\ 3 - i \\ 1 + 2i \end{pmatrix}$. Verify that $(\mathbf{x}, \mathbf{y}) = \overline{(\mathbf{y}, \mathbf{x})}$.

2. Compute \mathbf{A}^{-1} if $\mathbf{A} = \begin{pmatrix} 1 & 1 & -1 \\ 2 & -1 & 1 \\ 1 & 1 & 2 \end{pmatrix}$ is invertible.

3. If $\mathbf{A}(t) = \begin{pmatrix} e^{-t} & -e^{5t} \\ 3e^{-t} & 5e^{-5t} \end{pmatrix}$, compute $\frac{d\mathbf{A}}{dt}$ and $\int_0^1 \mathbf{A}(t)dt$.

4. Decide whether the set $\left\{ \begin{pmatrix} 1 \\ 2 \\ 1 \end{pmatrix}, \begin{pmatrix} 2 \\ 1 \\ -1 \end{pmatrix}, \begin{pmatrix} -1 \\ 1 \\ 2 \end{pmatrix} \right\}$ is linearly dependent or linearly independent.

5. Find the eigenvalues and bases for the corresponding eigenspaces of the matrix $A = \begin{pmatrix} 5 & -14 \\ -2 & 2 \end{pmatrix}$.