[1] Find an orthogonal basis for the subspace $V$ of $\mathbb{R}^5$ spanned by the vectors

\[
(1, 0, -1, 0, 1) \quad (0, 1, -1, 0, 0) \quad (0, 0, 1, -1, 0)
\]
[2] Let $V$ be the vector space of all polynomials $f(x)$ of degree $\leq 3$. Find a basis for the subspace $W$ defined by

$$f(x) = f(-x)$$

Extend this basis to a basis for $V$. 
Define the inner product of two polynomials $f$ and $g$ by the rule

$$
\langle f, g \rangle = \int_{-1}^{1} f(x) g(x) \, dx
$$

Using this definition of the inner product, find an orthogonal basis for the vector space of all polynomials of degree $\leq 2$. 
Find the matrix $e^{At}$, where $A = \begin{bmatrix} 2 & 2 & -2 \\ 0 & -1 & 1 \\ 0 & -1 & 1 \end{bmatrix}$. 
Find a matrix $A$ so $A^2 = \begin{bmatrix} -2 & 6 \\ -3 & 7 \end{bmatrix}$. 