Exam 4

Linear Algebra, Dave Bayer, May 10, 2007

Name: _____

[1] (5 pts)	[2] (5 pts)	[3] (5 pts)	[4] (5 pts)	[5] (5 pts)	TOTAL

Please work only one problem per page, starting with the pages provided. Clearly label your answer. If a problem continues on a new page, clearly state this fact on both the old and the new pages.

Do not use calculators or decimal notation. Please simplify each answer as far as possible.

[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 $\leqslant 3$. Find a basis for the subspace W defined by

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

Extend this basis to a basis for V.

[**3**] Define the inner product of two polynomials f and g by the rule

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

Using this definition of the inner product, find an orthogonal basis for the vector space of all polynomials of degree $\leqslant 2$.

[**4**] Find the matrix e^{At}, where $A = \begin{bmatrix} 2 & 2 & -2 \\ 0 & -1 & 1 \\ 0 & -1 & 1 \end{bmatrix}$.

[5] Find a matrix A so $A^2 = \begin{bmatrix} -2 & 6 \\ -3 & 7 \end{bmatrix}$.