Exam 2, 9:10-10:25

Linear Algebra, Dave Bayer, March 27, 2012

Name: ______________________________ **Uni:** ______________

[1]	[2]	[3]	[4]	[5]	Total

Please draw a box around your final answer. Please use each printed sheet (front and back) *only* for that problem, not for any other problem. There are blank sheets at the end of the exam, to give you more room to work. However, your final answer will not be graded unless it appears on the same sheet (front or back) as the printed problem.

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

$$f(1) = 0.$$

Extend this to a basis for V.

[2] By least squares, find the equation of the form $y = ax + b$ which best fits the data

$$\begin{bmatrix} x_1 & y_1 \\ x_2 & y_2 \\ x_3 & y_3 \end{bmatrix} = \begin{bmatrix} 0 & 2 \\ 1 & 3 \\ 2 & 0 \end{bmatrix}$$

[3] Let V be the subspace of $\mathbb{R}^5$ spanned by the vectors

$$(1,1,1,0,0), \qquad (0,0,1,1,1).$$

Find an orthogonal basis for the subspace V.

[4] Using Cramer's rule, solve for z in

$$\begin{bmatrix} 1 & 0 & 0 & 1 \\ 1 & 3 & 0 & 1 \\ 1 & 3 & 3 & 1 \\ 1 & 3 & 3 & 3 \end{bmatrix} \begin{bmatrix} w \\ x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \end{bmatrix}$$

[5] Let V be the subspace of $\mathbb{R}^4$ consisting of all solutions to the system of equations

$$\begin{bmatrix} 1 & 1 & -1 & -1 \\ 1 & -1 & -1 & 1 \end{bmatrix} \begin{bmatrix} w \\ x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}.$$

Find the matrix A which projects orthogonally onto the subspace V.