

Exam 2

Linear Algebra, Dave Bayer, Alternate, March 12, 2013

Name: _____ Uni: _____

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

If you need more than one page for a problem, clearly indicate on each page where to look next for your work.

[1] Find a basis for the set of solutions to the system of equations

$$\begin{bmatrix} 1 & 1 & 2 & 2 \\ 2 & 2 & 2 & 2 \\ 3 & 3 & 2 & 2 \end{bmatrix} \begin{bmatrix} w \\ x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$$

Extend this basis to a basis for \mathbb{R}^4 .

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

$$(x_1, y_1) = (-1, 0), \quad (x_2, y_2) = (0, 0), \quad (x_3, y_3) = (1, 2)$$

[3] Let L be the linear transformation from \mathbb{R}^2 to \mathbb{R}^2 which reflects first across the line $y = x$, then across the line $y = 3x$. Find the matrix A which represents L in standard coordinates.

[4] Find an orthogonal basis for the subspace of \mathbb{R}^4 spanned by the vectors

$$(1, 1, 1, 1), \quad (1, 2, 2, 2), \quad (1, 1, 2, 2), \quad (3, 4, 5, 5)$$

[5] Let V be the vector space of all polynomials of degree ≤ 4 in the variable x with coefficients in \mathbb{R} . Let W be the subspace of odd polynomials: those polynomials for which $f(-x) = -f(x)$. Find an orthogonal basis for W with respect to the inner product

$$\langle f, g \rangle = \int_0^1 f(x)g(1-x) dx$$