Math 227 Assignment 5

Due Thursday, March 15

1) Show that the following collections of vectors are subspaces of the indicated vector space.

a) (4 points) $\left\{ \begin{bmatrix} a & b \\ b & c \end{bmatrix} \;\middle|\; a, b, c \in \mathbb{R} \right\} \subseteq M_2(\mathbb{R})$,

b) (4 points) $\{(x, y, z, w) \mid 14x - 9y - 20z + w = 0\} \subseteq \mathbb{R}^4$

c) (4 points) $\{(a_n)_{n=1}^{\infty} \mid \lim_{n\to\infty} a_n = 0\} \subseteq \mathscr{S}$ (the vector space of sequences of real numbers).

2) (3 points) Let $S = \{(x, y) \;:\; |x| = |y|\} \subset \mathbb{R}^2$. Show that S is NOT a subspace of $\mathbb{R}^2$.

3) Given the points $(0, 3)$, $(-1, 4)$, $(-2, 7)$ and $(3, 1)$ in $\mathbb{R}^2$, find the best-fit quadratic to the points by

a) (4 points) Finding a system of linear equations that represents a "solution" to the problem,

b) (2 points) Writing the problem as a matrix equation $Ax = b$,

c) (2 points) Finding the system $A^tAx = A^tb$, computing both A^tA and A^tb,

d) (2 points) Solving the system in c) and producing the polynomial.