Math 54 Worksheet 13 GSI: Lionel Levine 3/7/05

1. Consider the vectors

$$\mathbf{v}_1 = (2, 1, -3)$$
  

$$\mathbf{v}_2 = (1, 1, 1)$$
  

$$\mathbf{v}_3 = (-4, 5, -1).$$

- (a) Are  $\mathbf{v}_1$ ,  $\mathbf{v}_2$  and  $\mathbf{v}_3$  orthogonal?
- (b) Prove that  $\mathbf{v}_1$ ,  $\mathbf{v}_2$  and  $\mathbf{v}_3$  form a basis for  $\mathbb{R}^3$ .
- (c) Find the coordinates of the vector (1, 2, 3) in this basis.

(d) Let 
$$A = \begin{pmatrix} 2 & 1 \\ 1 & 1 \\ -3 & 1 \end{pmatrix}$$
. Compute the matrix  $A^T A$ .

(e) Find the least-squares best fit line for the points (2,0), (1,1) and (-3,3).