# Math115 Test5: Independence and Subspaces

1. (a) These four vectors are not independent, find the vanishing relation between them and hence determine a basis for the vector space. [5]

$$v_1 := \begin{pmatrix} 3 \\ 5 \\ 2 \\ 1 \end{pmatrix}, \quad v_2 := \begin{pmatrix} -5 \\ -1 \\ -2 \\ 3 \end{pmatrix}, \quad v_3 := \begin{pmatrix} 3 \\ -2 \\ -8 \\ -4 \end{pmatrix}, \quad v_4 := \begin{pmatrix} 4 \\ 2 \\ -4 \\ -2 \end{pmatrix}$$

   (b) Find a vector orthogonal to $v_1$, $v_2$ and $v_3$. [5]

2. (a) Find the best fit quadratic for these data points:

| $x_i$ | -3 | -2 | 1 | 4 |
|---|---|---|---|---|
| $y_i$ | 3 | -1 | 0 | 3 |

[7]

   (b) Prove or disprove the subspace axioms for this set: $\left\{ \begin{pmatrix} x \\ y \end{pmatrix}; y > |x| \right\}$ [3]