Math 3280 Worksheet 13: Linear dependence, dimension, span, and bases.

Group members (2 to 4): _____

(1) Are the vectors $v_1 = \begin{pmatrix} 1 \\ -1 \\ 0 \end{pmatrix}$, $v_2 = \begin{pmatrix} 1 \\ 0 \\ -1 \end{pmatrix}$, and $v_3 = \begin{pmatrix} 0 \\ 1 \\ -1 \end{pmatrix}$ linearly

independent or dependent? If they are linearly dependent, find constants $c_1, c_2, c_3$, not all zero, such that $c_1 v_1 + c_2 v_2 + c_3 v_3 = 0$.

(2) What is the dimension of their span? (This is the largest number of independent vectors in the set $\{v_1, v_2, v_3\}$.)

(3) Find a basis for the subspace defined by the following equations for $(x_1, x_2, x_3, x_4, x_5) \in \mathbb{R}^5$:

$$2x_1 + x_3 - 2x_4 - 2x_5 = 0$$
$$x_1 + 2x_3 - x_4 + 2x_5 = 0$$
$$-3x_1 - 4x_3 + 3x_4 - 2x_5 = 0$$