

## Homework 5: Linear Independence

1. §4.3, #3(a), 4(a), 15(b), 16(a)(c).

Try to solve # 15(b) and 16(a) with as few computations as possible, and try to be fairly rigorous for 16(c).

2. Let  $\{\mathbf{v}_1, \mathbf{v}_2, \mathbf{v}_3, \mathbf{v}_4\}$  be a linearly independent set of vectors in a vector space  $V$ . Using only the definition of linear independence, prove that  $\{\mathbf{v}_1, \mathbf{v}_2, \mathbf{v}_3\}$  is linearly independent as well.

Hint. Begin the proof as follows:

“Suppose  $k_1\mathbf{v}_1 + k_2\mathbf{v}_2 + k_3\mathbf{v}_3 = \mathbf{0}$ . I must show that  $k_1 = k_2 = k_3 = 0$ .”

3. Using only the definition of linear independence, prove that if  $\{\mathbf{u}, \mathbf{v}, \mathbf{w}\}$  is linearly independent, then so is  $\{\mathbf{u} + \mathbf{v}, \mathbf{u} + 2\mathbf{w}, \mathbf{v} + 3\mathbf{w}\}$ .

Hint. Begin the proof as follows:

“Suppose  $c(\mathbf{u} + \mathbf{v}) + d(\mathbf{u} + 2\mathbf{w}) + e(\mathbf{v} + 3\mathbf{w}) = \mathbf{0}$ . I must show that  $c = d = e = 0$ .”