

(This is the coversheet for the homework. The problems refer to Anton and Rorres 10th ed. of *Elementary Linear Algebra: applications version*. See Problem Set 1, 2 or 3 for further formatting.)

**\*\*you are free to use technology to do row-reductions etc... however, you still must show your work by explaining where the matrix came from and writing sentences about why you are doing what you do\*\***

**Problem 41** Is  $(1, 2, 3) \in \text{span}\{v_1, v_2, v_3\}$  given that  $v_1 = (1, 1, 1)$ ,  $v_2 = (2, 2, 2)$ ,  $v_3 = (-1, 0, 1)$ ? If it is then find the linear combination  $\{v_1, v_2, v_3\}$  which yields  $(1, 2, 3)$ .

**Problem 42** Let  $v_1, v_2, v_3$  be as above. Is  $\{v_1, v_2, v_3\}$  linearly independent? If it is linearly dependent then use the CCP to find a linear dependence between the vectors.

**Problem 43** § 4.2 # 8 (span of 3-vectors)

**Problem 44** § 4.3 # 2 (test for LI )

**Problem 45** § 4.3 # 8 (on linear dependence)

**Problem 46** § 4.4 # 2 (basis for  $\mathbb{R}^2$ ?)

**Problem 47** § 4.4 # 8 (find coordinate vectors)

**Problem 48** § 4.5 # 4 (find dimension of solution space)

**Problem 49** § 4.5 # 8 (4 dimensional geometry)

**Problem 50** § 4.5 # 12 (extending linearly dependent set to make basis)

**Problem 51** What is the least number of linear equations it takes to determine a

- (a.) a line in  $\mathbb{R}^3$
- (b.) a line in  $\mathbb{R}^4$
- (c.) a plane in  $\mathbb{R}^4$
- (d.) a plane in  $\mathbb{R}^5$

**Problem 52** Suppose  $W = \text{span}\{v_1, v_2, \dots, v_k\} \subseteq \mathbb{R}^n$ . Is this a  $k$ -dimensional subspace of  $\mathbb{R}^n$ ? Justify your answer, a simple yes or no is not sufficient here. I would like you to outline some strategy or calculation that would allow you to ascertain the dimension of this subspace.

**Problem 53** Given  $k$ -points in  $n$ -dimensional space where  $k > n$  what is the dimension of the subspace on which the points reside? I'll give this question more concretely; what is the dimension of the subspace of  $\mathbb{R}^4$  which contains

$$(1, 2, 3, 4, 0), (0, -1, 1, 1, 3), (1, 1, 1, 1, 1), (3, 5, 7, 9, 1), (3, 4, 8, 10, 4) ?$$

**Problem 54** § 3.4 # 6 (find point and direction vector for a line)

**Problem 55** § 3.4 # 12 (find parametrization of plane)