

PHILADELPHIA UNIVERSITY
DEPARTMENT OF BASIC SCIENCES

Exam 2

Linear Algebra

21-12-2014

1. Let $v = (5, -3, 1)$ and $w = (6, 9, -3)$.
 - (a) Compute the length of v .
 - (b) Compute the length of w .
 - (c) Compute the distance between v and w .
 - (d) Compute the angle between v and w .

2. For the matrix A :

$$A = \begin{bmatrix} 1 & 2 & 2 & 4 \\ 3 & 8 & 6 & 16 \\ 0 & 1 & 0 & 2 \end{bmatrix}$$

- (a) Find a basis for the solution space of A .
 - (b) Find a basis for the column space of A .
3. Consider the vectors in $\{(1, 1, 1), (1, 2, 3), (1, 4, 9)\}$.
 - (a) Do they span or not span R^3 ?
 - (b) Are they linearly dependent or independent?
 - (c) Do they form a basis for R^3 ?
 4. Given the old basis $\{(0, 2), (2, 0)\}$ and the new basis $\{(1, 1), (-1, 1)\}$ for R^2 :
 - (a) Find the matrix of transition from the old to the new basis.
 - (b) Find the new coordinates of the old point $(3, 5)$.
 - (c) Find the old coordinates of the new point $(2, 2)$.
 5. Change the basis $\{(2, 2, 1), (-2, 1, 2), (2, 0, 0)\}$ for R^3 to an orthonormal basis using the Gram-Schmidt process. Hint: recall the formula

$$\text{new } v_3 = v_3 - (v_3 \cdot v_1)v_1 - (v_3 \cdot v_2)v_2$$