Shalom Azar

Linear Algebra - Pre-Course Exercises

1. Find all solutions to the following systems of linear equations:

a. (-20/3,-14/3,2/3)

b. No solution

2. Find a basis for the solutions of the following system of linear equations:

2𝑥1 − 𝑥2 + 𝑥3 + 2𝑥4 = 0 𝑥1 + 2𝑥2 + 𝑥3 + 3𝑥4 = 0 5𝑥1 −5𝑥2 +2𝑥3 +3𝑥4 = 0

Basis is columns 1-3

B = {[2,1,5], [-1, 2, 5],[1,1,2]}

3. Find a basis for the following subspace of R4:

Basis is columns 1,2,4

B = {[1,2,1,-1], [0,5,4,-5],[2,-1,-2,3]}

4. Find the spanning set for the null space of the following matrix:

Spanning set [0,0,0,0]∈Null(A)

5. For each of the following matrices, determine whether it is invertible, and if it is, compute its inverse matrix.

a. inverse of 𝐴1=[ [-1,2], [3,-5]]

b. 𝐴2 is not invertible

c. Inverse of A3 =[ [-2/3,1/6,-1/6], [-5/6,1/6,-1/6],[0,1/2,1/2]]

6. Consider the following matrix:

1. Compute the determinant of A (your answer will be in terms of 𝑥) :
   1. Det(A) = -X2 + 3x -2
2. For what values of 𝑥 is the matrix 𝐴 invertible?
   1. For all values of x, matrix A is invertible except {1,2}

7. Consider the following basis for R2: {[3,2],[1,1]}

[X]B = [3,-4]

8.

Λ = {-2,1,3}

An Eigen Vector for Λ = 1 is [1,1/8,-3/4]

An Eigen Vector for Λ = 3 is [4,1,0]

An Eigen Vector for Λ = -2 is [1,-1,0]

9.

Λ = {0,-2}

An Eigen Vector for Λ = 0 is [2,-1]

An Eigen Vector for Λ = -2 is [1,-1]

AD = [[0,0],[0,-2]]

P = [[2,1],[-1,-1]]

P-1 = [[-1,-1],[1,2]]

Ak = P\*AD\*P-1

Ak = [[(-2)k, 2(-2)k],[-(-2)k, -2(-2)k]]

10.

Orthogonal Basis = {

Z1 = [1/2.1/2,1/2,-1/2],

Z2 = [SQRT(3)/2, -(SQRT(3))/6, -(SQRT(3))/6, (SQRT(3))/6],

Z3 = [3\*SQRT(27900)/27900, 111\*SQRT(27900)/27900, 111\*SQRT(27900)/27900, 57\*SQRT(27900)/27900]}