MAT 216: Linear Algebra & Fourier Analysis

MNS, BRAC University

System of Linear Equation

Reference Book: Howard Anton and Chris Rorres

1. Exercise Set 1.2
    a. 1 (c,d,e,h,i,j)
    b. 2 (d,e,f)
    c. 3 (a,d,e,f)
    d. 4 (c)
    e. 5 (c,d)
    f. 6 (b,c), 7
    g. 8 (b,c,d), 9
    h. 10 (b,c)
    i. 12 (a,c), 13
    j. 14, 15
    k. 17, 23, 25, 26
2. Exercise Set 1.3
    a. 2
3. Exercise Set 1.6
    a. 11, 12, 13, 14, 17, 19

Reference Book: **Gilbert Strang Linear Algebra**

1. Problem Set 2.2
    a. 13, 14, 15, 21
2. Problem Set 2.3
    a. 24, 25, 27, 29

Vector Equations

1. Let v1=(1,0,1) and v2=(0,0,1), let b1=(0,2,0) and b2=(-3,0,7). Are b1 b2 linear combinations of v1 and v2?
2. Let v1=(1,-2,-5) and v2=(2,5,6), let b=(7,4,-3). Is b a linear combination of v1 and v2?
3. Let v1=(1,0,2) , v2=(0,1,0) and v3=(2,1,4), let b=(1,0,1). Is b a linear combination of v1, v2 and v3?
4. Let v1=(2,1,3) , v2=(4,2,6) and v3=(6,4,9), let b=(8,8,12). Is b a linear combination of v1, v2 and v3?
5. Is the vector b=(7,4,-3) in the span of the vectors v1=(1,-2,-5), v2=(2,5,6)?
6. Is the vector b=(1,0,1) in the span of the vectors v1=(1,0,2), v2=(0,1,0) and v3=(2,1,4)?
7. Is the vector b=(8,8,12) in the span of the vectors v1=(2,1,3), v2=(4,2,6) and v3=(6,4,9)?

Reference Book: Howard Anton and Chris Rorres

1. Exercise Set 5.2
    a. 7, 8
    b. 9 (a,c), 10 (a, d)
    c. 11 (c, d), 13, 14

The Matrix Equation Ax=b

Solution Set of Linear Systems

Applications of Linear Systems

Linear Independence

Reference Book: Howard Anton and Chris Rorres

1. Exercise Set 5.3
    a. 2 (a, b, d)
    b. 3 (a, c, d)
    c. 4 (d)
    d. 5 (b), 6 (b, c)
    e. 7, 8, 9
    f. 19

Reference Book: **Gilbert Strang Linear Algebra**

1. Problem Set 3.5
    a. 1, 2, 5
2. Are the vectors below linearly independent? v1=(0,1,5), v2=(1,2,8), v3=(4,-1,0).
3. Are the vectors below linearly independent? v1=(1,2,3), v2=(4,5,6), v3=(2,1,0).
4. Are the vectors below linearly independent? v1=(8,3,0,-2), v2=(4,11,-4,6), v3=(2,0,1,1), v4=(3,-9,-5,3), v5=(0,-2,-7,7).

Linear Transformations

Reference Book: **Howard Anton and Chris Rorres**

1. Exercise Set 4.2
    a. 1 (a, c, d), 2 (b, d)
    b. 3, 5 (b, c)
    c. 8, 9
    d. 12, 13, 17, 18
2. Exercise Set 4.3
    a. 2 (b, d)
    b. 3, 5 (b,c)
    c. 6 (a,d), 8 (b, d), 9 (a, d), 11 (b)
    d. 16 (b)
3. Exercise Set 4.4
    a. 2, 3

Reference Book: Gilbert Strang Linear Algebra

1. Problem Set 7.1
    a. 3, 4, 6, 7, 8
2. Problem Set 7.2
    a. 5, 10, 11

Matrix Operations

Reference Book: Howard Anton and Chris Rorres

1. Exercise Set 1.3
    a. 8, 10, 13, 16, 17, 22

Reference Book: Gilbert Strang Linear Algebra

1. Problem Set 2.4
    a. 3, 5, 6, 16, 32, 34

The Inverse of a Matrix

Reference Book: Howard Anton and Chris Rorres

1. Exercise set 1.5
    a. 6 (c), 7 (a, b, d), 8(a, b, d), 9 (c)
    b. 14, 16, 19 (b)

Reference Book: Gilbert Strang Linear Algebra

1. Problem Set 2.5
    a. 10, 23, 24
    b. 27, 30, 31
    c. 40, 44

Characterizations of Invertible Matrices

Applications to Computer Graphics

Determinants

Reference Book: Howard Anton and Chris Rorres

1. Exercise Set 2.1
    a. 2, 3, 7, 8
    b. 15 (a), 17, 20
    c. 22, 30

Reference Book: Gilbert Strang Linear Algebra

1. Problem Set 5.1
    a. 2, 7, 13, 14, 16, 24, 27
2. Problem Set 5.2
    a. 11, 12
3. Problem Set 5.3
    a. 2 (b), 6, 9, 39

Vector Spaces and Subspaces

Reference Book: Howard Anton and Chris Rorres

1. Exercise Set 5.1
    a. 1-10, 12-16, 17, 18, 20, 22
2. Exercise Set 5.2
    a. 1 (b, c, e), 2 (b, c, d, e), 3 (b, c)

Reference Book: Gilbert Strang Linear Algebra

1. Problem Set 3.1
    a. 1, 2, 10, 11

Null, Column, and Row Spaces

Reference Book: Howard Anton and Chris Rorres

1. Exercise Set 5.5
    a. 3 (a, b, d, e), 4 (a, b), 5 (b, d)
    b. 6 (a, c, d), (8,9,10) (a, c, d)
    c. 11 (b, c), 12 (b, c)

Reference Book: Gilbert Strang Linear Algebra

1. Problem Set 3.6
    a. 2, 3, 6, 17

Basis, Dimension

Reference Book: Howard Anton and Chris Rorres

1. Exercise Set 5.4
    a. 2 (b, c), 3 (a, d)
    b. 5, 7 (a, c)
    c. 9 (b), 10 (b), 11
    d. 12, 14, 16, 17, 18 (a, c, d), 27 (a, c)

Reference Book: Gilbert Strang Linear Algebra

1. Problem Set 3.5
    a. 17, 38 (a, b, c, d)

Coordinate Transformation

Reference Book: Linear Algebra- Sunny Geneseo

1. Lecture 18 (Examples)
    a. 18.2, 18.3, 18.4, 18.5, 18.6, 18.7, 18.8, 18.9

Rank of a Matrix

Reference Book: Howard Anton and Chris Rorres

1. Exercise Set 5.6
    a. 2 (a, b, d, e)
    b. 9, 12, 13

Reference Book: Linear Algebra- Sunny Geneseo

1. Lecture 17 (Examples)
    a. 17.4, 17.5

Eigenvalues and Eigenvectors

Reference Book: Howard Anton and Chris Rorres

1. Exercise Set 7.1
    a. (2, 3) (a, b, d, e, f)
    b. (5, 6) (a, c, f)
    c. (8, 9) (b)
    d. 11, 12, 22
2. Exercise Set 7.2
    a. 1, 2 (a, b)

Reference Book: Gilbert Strang Linear Algebra

1. Problem Set 6.1
    a. 3, 5, 6, 27, 28, 29

The Characteristic Equation

Reference Book: Howard Anton and Chris Rorres

1. Exercise Set 7.1
    a. 1 (a, b, d, e, f)
    b. 4 (a, c, f)
    c. 7 (b)

Diagonalization

Reference Book: Howard Anton and Chris Rorres

1. Exercise Set 7.2
    a. 2 (c), 3, 5, 6, 7, 8, 10, 11
    b. 12, 14, 16, 17
    c. 19, 20 (a, b, d)
    d. 21, 22
2. Exercise Set 7.3
    a. 1 (a, b, c), 2, 3, 5, 8
    b.

Reference Book: Gilbert Strang Linear Algebra

1. Problem Set 6.2
    a. 18, 19

Applications

Reference Book: Gilbert Strang Linear Algebra

1. Section 6.3
    a. Example 1, Example 2, Example 5, Example 6
    b. Worked Example 6.3B,
2. Problem Set 6.3
    a. 1, 5, 10, 24, 25

Inner Product

Reference Book: Howard Anton and Chris Rorres

1. Exercise Set 6.1
    a. 1, 3 (a, b)
    b. 10, 13 (a, b)
    c. 15 (a, b), 16, 18 (a)

Length and Orthogonality

Reference Book: **Howard Anton and Chris Rorres**

1. Exercise Set 6.2
    a. 2, 3, 5 (c, f)
    b. 9 (a, b)
    c. 15 (a, b, c), 16 (a, b), 17 (a, b)
    d. 18 (a, c, d)

Reference Book: **Gilbert Strang Linear Algebra**

1. Problem Set 4.1
    a. 17, 21, 22

Reference Book: **Linear Algebra- Sunny Geneseo**

1. Lecture 20
    a. Example 20.3, Example 20.6, Example 20.8
    b. Example 20.13, Example 20.16, Example 20.18

Orthogonal Sets

Reference Book: **Howard Anton and Chris Rorres**

1. Exercise Set 6.3
    a. 1 (a, b, c, d), 2
    b. 3 (a, b, c, d), 4
    c. 5 (a), 6 (b)

Reference Book: **Gilbert Strang Linear Algebra**

1. Problem Set 4.4
    a. 1

Orthogonal Projections

Reference Book: **Howard Anton and Chris Rorres**

1. Exercise Set 6.4
    a. 4, 5, 6, 11(b)

Reference Book: **Gilbert Strang Linear Algebra**

1. Problem Set 4.2
    a. 1, 2, 5, 11, 16, 30

The Gram Schmidt Process

Reference Book: **Howard Anton and Chris Rorres**

1. Exercise Set 6.3
    a. 16 (a, b), 17 (a, b), 18, 19, 20

Reference Book: **Gilbert Strang Linear Algebra**

1. Problem Set 4.4
    a. 15 (a, b, c), 18, 21, 22

Least Squares Approximations

Reference Book: **Howard Anton and Chris Rorres**

1. Exercise set 6.4
    a. 3 (a, b, c, d)

Reference Book: **Gilbert Strang Linear Algebra**

Methods of Solving Boundary Value Problems

Reference: **Note on Fourier Analysis**

1. Section 8.1
    a. Example (1-8)
2. Section 8.2
    a. Example (1-5)

Reference Book: **Fourier Analysis, Schaum's Series**

1. Solved Problem : 1.10, 1.11,

Applications of Boundary Value Problems

Fourier Series and Applications

Reference: **Note on Fourier Analysis**

1. Section 8.6
    a. Example (1-4)

Periodic Function

Reference Book: **Fourier Analysis, Schaum's Series**

1. Chapter 2
    a. Example (1,2,3,4)

Half range Fourier Sine and Cosine Series

Reference: **Note on Fourier Analysis**

1. Section 8.4
    a. Example (1-5)
2. Section 8.5
    a. Example (1-5)

Reference Book: **Fourier Analysis, Schaum's Series**

1. Chapter 2
    a. Solved Problem (2.8-2.12)
    b. Supplementary Problem (2.34-2.42)

Convergence

Reference: **Note on Fourier Analysis**

1. Section 8.7
    a. (Def: Convergence of Fourier series)
    b. All Facts

Reference Book: **Fourier Analysis, Schaum's Series**

1. Chapter 2
    a. Solved Problem (2.18-2.23)

Persval's Identity

Reference Book: **Fourier Analysis, Schaum's Series**

1. Chapter 2
    a. Solved Problem (2.13-2.15)
    b. Supplementary Problem (2.46-2.49)
2. Chapter 3
    a. Supplementary Problem (3.22-3.23)
3. Chapter 5
    a. Supplementary Problem (5.30-5.34)

Uniform Convergence

Integration and Differentiation of Fourier Series

Reference Book: **Fourier Analysis, Schaum's Series**

1. Chapter 2
    a. Solved Problem (2.16,2.17)
    b. Supplementary Problem (2.43, 2.44, 2.45)

Complex Notation of Fourier Series

Double Fourier Series

Reference Book: **Fourier Analysis, Schaum's Series**

1. Chapter 2
    a. Solved Problem 2.24

Applications of Fourier Series

Reference Book: **Fourier Analysis, Schaum's Series**

1. Chapter 2
    a. Solved Problem (2.25-2.29,2.32,2.33)
    b. Supplementary Problem (2.50,2.51,2.52,2.55,2.56,2.58,2.63,2.64,2.65,2.69,2.70)

Orthogonality with respect to a Function

Reference: **Note on Fourier Analysis**

1. Section 8.3

a. (Fact 1, Fact 2, Fact 3, Definition)
b. Example 1, 2, 3
c. Fact

Reference Book: Fourier Analysis, Schaum's Series

1. Chapter 3
    a. Solved Problem (3.15-3.21)
    b. Supplementary Problem (3.41,3.42,3.43)

Fourier Transformation

Reference Book: Fourier Analysis, Schaum's Series

1. Chapter 5
    a. Solved Problem (5.4-5.6, 5.12, 5.21,5.22,5.23)
    b. Supplementary Problem (5.24, 5.25, 5.29, 5.42-5.47)

Fourier Sine and Cosine Transformation

Reference Book: Fourier Analysis, Schaum's Series

1. Chapter 5
    a. Solved Problem
    b. Supplementary Problem (5.26, 5.27, 5.28)