**Chapter 1:**

1. Find the domain and the range of a function:

Ex: 

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2. Symmetry:

+ Even function:..................................................................................................................

+ Odd function: :..................................................................................................................

Ex: 

3. Linear function:...............................................................................................................

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4. Polynomial function: ...................................................................................................

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5. Rational function: .........................................................................................................

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6. Trigonometric function: ................................................................................................

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7. Power function: .........................................................................................................

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8. Exponential function: ......................................................................................................

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9. Transformations:

+ :............................................................................................................

+ :.....................................................................................................................

+ :.....................................................................................................................

10. Limit:

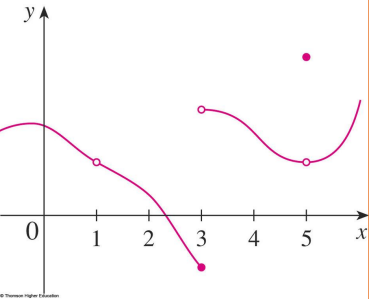
+ Calculate :

- :...........................................................................................................

- :...........................................................................................................

Ex: 

+ Find limit graphically:



11. Continuity:

+ At a number:......................................................................................................................

Ex1: 

Ex2: 

+ An interval:.......................................................................................................................

12. Composite function:  defined by 

Ex: 

+  .................................................................

+  ................................................................

13.Asymptote:

+ Vertical asymptote: ............................................................................................................

+ Horizontal asymptote: ........................................................................................................

Ex: 

**Chapter 2:**

1. Derivatives:

+ At a number: ......................................................................................................

+ Of a function:.....................................................................................................

+ Composite function:...........................................................................................

Ex1: 

Ex2: 

Find 

2. Differentiation:

+ Formula:..................................................................................................................

+ Properties:

-...................................................................................................................................

-...................................................................................................................................

Ex: 

3. Tangent line of a curve:

+ Formula:..................................................................................................................

+ Properties:...............................................................................................................

Ex: 

4. Implicit differentiation: 

Ex: 

5. A tangent line of a curve :......................................................................

Ex: 

6. Related Rates:

+ Air is being pumped into a spherical balloon so that its volume increases at a rate of 100 cm3/s. How fast is the radius of the balloon increasing when the diameter is 50 cm?

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+ A ladder 10 ft long rests against a vertical wall. If the bottom of the ladder slides away from the wall at a rate of 1 ft/s, how fast is the top of the ladder sliding down the wall when the bottom of the ladder is 6 ft from the wall?

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**Chapter 3:**

1. Min, max:

+ Absolute maximum:.................................................................................................

+ Absolute minimum:.................................................................................................

+ Local (relative) maximum:......................................................................................

+ Local (relative) minimum:.......................................................................................

+ Critical numbers:.......................................................................................................

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Ex: 

2. Rolle's theorem: ............................................................................

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Ex: 

3. Lagrange's theorem/the mean value theorem: .....................................................................

...........................................................................................................

Ex: 

4. Increasing:....................................................................................

5. Decreasing:..................................................................................

6. Concave upward: ..........................................................................

7. Concave downward: .....................................................................

8. Inflection points: ............................................................................

Ex: 

9. Optimization Problems:

+ Find two positive numbers such that the sum is 24 and the product is the largest?

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+ Find two positive numbers such that the product is 36 and the sum is the smallest?

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+ Find the point on the line y = 2x - 3 that is closest to the origin.

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+ A farmer has 2400 ft of fencing and wants to fence off a rectangular field that borders a straight river. He needs no fence along the river. What are the dimensions of the field that has the largest area?

10. Newton’s Method:

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Ex: 

11. Antiderivative:

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**Chapter 4-6:**

1. Area problem: , 

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| *x* |  |  |  |  |  |  |  |
| *f(x)* |  |  |  |  |  |  |  |

+ Right endpoints:

+ Left endpoints:

+ Midpoint rule:

+ Trapezoidal rule:

+ Simpson’s rule:

2. FTC:

+ FTC1:

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..........................................................

EX:  ....................

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+ FTC2:  ...............................................

 .............................................................

3. Position , velocity , acceleration 

+ 

+ 

+ Displacement = ....................................................

+ Distance (total) = .................................................

4. Mean value theorem (average value): 

Ex: 

5. The Substitution Rule: 

Ex: 

+ u = ..............; du = ......dx

+ I = ..............................................................................................................................

6. Integration by parts: 

Ex1: 

+ 

+ 

Ex2: 



Ex3: .....................................................................................................................

7. Improper integrals:

+  ........................................................if f is continuous

+ Suppose that  are continuous



a. : .......................................................................................................................

b.  .......................................................................................................................

c. : .................................................................................................................

+  :.........................................................................................................................

Ex: 

+ f has a discontinuity at c (): .........

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Ex: 

**Chapter 8:**

1. Limit of a sequence:

{an} converges: ..................................................

Ex:  , 

2. Two sequences: 

+  :..............................................................

+ :..................................................................

+ :.....................................................................

3. The series  :

+ is an infinite sum: ........................................................................................

+ convergent: ...............................................................................................

+ Geometric series: , is convergent iff .................................

Ex: 

4. Divergence test:

+  .....................................................................................................

+  .....................................................................................................

Ex:  , 

5. Integral test:

+ is convergent iff ..........................................................................

+ :...................................................................................................

Ex: , 

6. Comparison test:

If  then 

+..............................................................................................................

+..............................................................................................................

Ex: , 

7. Alternating series :

+..................................................................................................................

Ex: 

8. Absolute convergence:

+  is absolutely convergent if .........................................................

+ Conditionally convergent if .................................................................

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Ex: 

9. Ratio and root test:

+ ............................................

+ ............................................

+.............................................

Ex: 

Table:

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10. Radius of convergence:

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11. Interval of convergence:

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Ex: 

12. Power series :

+  ..............................

+ Domain: ........................................................................................................................

Ex: 

13. Taylor series:





14. Maclaurin series:



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+  ......................................................................................................................

+  ................................................................................................................

+  ................................................................................................................

+  ..............................................................................................................

15. Taylor polynomial Tn:

+ Degree:..........................................................

+ Approximate:.................................................

Ex1: 

Ex2: 

**Chapter 1:**

1. Solutions:

+............................................................................................................................................

+............................................................................................................................................

+............................................................................................................................................

2. Consistent and inconsistent:

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3. Parameter:

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4. Augmented matrix, coefficients matrix and constant matrix:

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Ex: 

5. Elementary Operations:

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Ex: 

6. Row-echelon matrix:

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7. The rank of a matrix:

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Ex: 

8. Homogeneous system:

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+ Trivial solution:...............................................................................................................

+ Nontrivial solution:..........................................................................................................

Ex:  ,

**Chapter 2:**

1. Matrix  :

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2. Identity matrices:

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3. Triangular matrices:

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4. Matrix Addition:

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5. Scalar Multiplication:

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6. Transpose:

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Ex: 

7. Matrix Multiplication:

+ Condition:

+  

Ex: 

+ Properties:

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8. Matrix equation:

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9. Matrix inverse:

+ Definition:.................................................................................................................

+ Properties:

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+ Find :

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10. Solve a matrix equation using an inverse:

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11. Matrix Transformations:

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**Chapter 3:**

1. Determinant of  :

+  ..............................................................................................................

Ex:  =............................................................................................................

+  =..........................................................................

Ex:  , det (A) =.................................................................................

+ The minor : .......................................................................................................

+ The cofactor  ..................................................................................................

Ex: 

+ ..............................................................................................................

+ ..............................................................................................................

Ex:  ....................................................................................................

2. Adjugate matrix:  .....................................................................................

3. The inverse of *A*:  .........................................................................................

Ex: 

4. Properties:

-  .......................................................................................................

- If A is an nxn triangular matrix then det(A) = .................................................................

- Elementary operations:

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5. Theorem:

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- A is invertible iff .......................................

6. Cramer’s Rule:

- The system  has unique solution iff ..............................................................

- Cramer’s system AX = B:

+ ...............................................................................................

+ ...............................................................................................

+ ...............................................................................................

7. Diagonal matrices:

+ .......................................................

+ .....................................................................................

+ If  then ......................................................

8. Characteristic polynomial:  ................................................................................

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9. Eigenvalue λ:...................................................................................................................

10. Eigenvector :............................................................................................................

11. Diagonalize the matrix A: ............................................................................................

12. Diagonalizable:..............................................................................................................

Ex: 

13. Properties:

-...........................................................................................................................................

-...........................................................................................................................................

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**Chapter 5:**

1. The vector space Rn:........................................................................................................

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+  ........................................................................................................................

+ Basis: ..............................................................................................................................

2. Linear combination:.......................................................................................................

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3. Linearly dependent:........................................................................................................

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4. Linearly independent:.....................................................................................................

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5. Subspace of Rn:

- Basis and dimension:........................................................................................................

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- Solution space of a homogeneous system of linear equations null(A) :..........................................................................................................

+ DimU = ...........................................................................................................................

+ Basis:................................................................................................................................

- Span (V): ..........................................................................................................................

+ DimV = ...........................................................................................................................

+ Basis:................................................................................................................................

- Properties: If , then

+  .................................................................................................................................

+ The set is .........................................................................................

6. Theorem: Let U ⊆ V be subspaces of Rn. Then:

+ dim U ......dimV

+ If dim U = dim V, then .............................

7. Orthogonal set:.............................................................................................................

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8. Orthonormal set:.........................................................................................................