**Week 1: Linear Algebra Basics for AI**

**Topics:**

1. **Numbers: Integers, Rational, Irrational, Real, Complex**
2. **Accuracy, Precision, Resolution, Standards**
3. **Scalars, Row and Column Vectors in 2D, Matrices, and N Dimensions**
4. **Vectors and Matrices** – Definition, addition, multiplication, and basic operations.
5. **Matrix Transpose and Inverse** – Understanding transformations and solving linear equations.
6. **Determinants and Rank** – Importance in data consistency and transformations.

**AI Relevance:**

* Neural networks use vectors and matrices to store input data and weights.
* Matrix operations (like multiplication and transposition) form the basis of deep learning computations.

**Week 2: Calculus Basics for AI**

**Topics:**

1. **Functions and Limits** – Understanding change and continuity.
2. **Derivatives and Chain Rule** – Basics of rate of change and simple differentiation.
3. **Integrals and Area Under the Curve** – Concept of accumulation and definite/indefinite integrals.

**AI Relevance:**

* Derivatives help optimize neural networks through gradient descent.
* Understanding change in functions is key to loss minimization in AI models.

**Week 3: Introduction to Convolutions & Transformations**

**Topics:**

1. **Bayes’ Theorem (Probability)** – Understanding conditional probability and its applications.
2. **Partial Derivatives & Gradients (Multivariable Calculus)** – Understanding how functions change with multiple variables.
3. **Taylor Series Approximation (Calculus) – Expanding functions into infinite series for approximation.**
4. **AI Relevance:**

Used in optimizing loss functions and approximating activation functions in neural networks.

Helps approximate complex AI functions with simpler polynomial expressions.

Backpropagation in neural networks relies on computing gradients.

Optimization algorithms (Gradient Descent, Adam, RMSProp) use gradients to minimize loss functions.

Used in Naïve Bayes classifiers for spam filtering and text classification.

Essential for probabilistic models in machine learning and deep learning.

**Week 4: Introduction to SymPy for Math in AI**

**Topics:**

1. **Symbolic Computation Basics** – Using SymPy for algebraic simplifications.
2. **Differentiation and Solving Equations** – Automating calculus problems.
3. **Matrix Operations with SymPy** – Performing basic AI-related matrix calculations.

**AI Relevance:**

* Symbolic differentiation helps understand AI model training.
* Automated equation solving helps in tuning AI models efficiently.