**🧠 Project Overview:**

**Project Title:** Matrix Calculator with Java Swing  
**Goal:** To build an interactive Java-based matrix calculator GUI that can perform various matrix operations.

**🧱 Key Features to Implement:**

**🎛️ Basic Operations:**

* Addition
* Subtraction
* Multiplication (Matrix x Matrix)
* Scalar Multiplication
* Transpose
* Determinant
* Inverse (where applicable)
* Rank
* Identity Matrix Generation

**🧩 Project Structure:**

**1. Frontend (UI) – Swing & JPanel**

* Use **JFrame** as the main window.
* Use **JPanel** to separate sections: input panel, output panel, operation buttons.
* Use **JTable or JTextFields** for matrix input.
* Buttons for each operation (Add, Subtract, etc.).
* Label or JTextArea for displaying results.
* Optional: Allow dynamic matrix size using spinner/dropdown.

**2. Backend – Logic Layer**

Create a class like MatrixOperations to:

* Take 2D arrays as matrix input.
* Perform operations like:
  + add(int[][] A, int[][] B)
  + multiply(int[][] A, int[][] B)
  + transpose(int[][] A)
  + etc.

**3. Error Handling**

* Size mismatch
* Invalid input (non-integer values)
* Singular matrices (for inverse)
* Determinant only on square matrices

**🧠 UX/UI Flow:**

1. **Welcome Screen (Optional)**
   * Title & “Start Calculator” button
2. **Input Matrix Section**
   * Select matrix size (rows & columns)
   * Enter elements
3. **Select Operation**
   * Buttons for each operation
   * Maybe a dropdown if UI is crowded
4. **Result Display**
   * Show resultant matrix in a new panel or below input
   * Add reset/clear button

**📦 Project Folder Structure (Suggestion):**

MatrixCalculator/

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├── src/

│ ├── Main.java

│ ├── GUI/

│ │ ├── MatrixUI.java

│ │ └── InputPanel.java

│ └── Logic/

│ └── MatrixOperations.java

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├── resources/ (optional icons, logos)

└── README.md

**🧪 Enhancements (Optional):**

* Export result matrix as CSV or text
* Save past operations history
* Dark/Light mode toggle
* Animation or graphical visualization (for learning)

**🛠️ Tools/Technologies:**

* Java (JDK 11+)
* Java Swing (JFrame, JPanel, JTable, JButton, etc.)
* IntelliJ IDEA / Eclipse
* Git for version control

**📋 Trello Board: *Matrix Calculator - Java Swing***

**🟡 Backlog**

Tasks you’ll plan or prioritize later.

* Research best matrix input methods in Swing (JTable vs JTextFields)
* Look for icons/graphics for UI polish (optional)
* Plan layout wireframe on paper/Figma

**🟢 To Do**

Tasks you need to start soon.

* Set up project structure and initialize Git
* Create MatrixOperations class with basic operations
* Design main JFrame window
* Build UI input panel for matrix A
* Build UI input panel for matrix B
* Add dropdown/spinners to set matrix dimensions
* Add operation buttons (Add, Subtract, Multiply, etc.)
* Implement matrix display panel for output
* Add clear/reset button

**🔵 In Progress**

Tasks currently being developed.

* Implement matrix addition and subtraction logic
* Connect matrix input from UI to logic
* Show output matrix on result panel

**🟣 Testing**

Tasks for debugging and verification.

* Test matrix size mismatch errors
* Test edge cases (e.g., zero matrix, identity)
* Test inverse and determinant with non-square matrices
* Test UI responsiveness for different matrix sizes

**✅ Done**

Completed tasks.

* Initialized Java project with JFrame base window
* Basic layout using JPanel
* Matrix input with default values

**🌟 Bonus/Enhancements**

Optional features.

* Export matrix as CSV
* Add light/dark theme toggle
* Add matrix history (last 5 operations)
* Show step-by-step solution for determinant or inverse