1. Matrix Class:

Instance Variables:
double[][] array;
int numberOfRows;
int numberOfColumns;
int rank; (Include rank as a calculated property)

Constructors:
Matrix() (Default to 2x2 identity matrix)
Matrix(int rows, int cols) (Construct a matrix of specified size)
Matrix(double[][] data) (Construct a matrix from existing data)
Matrix(Matrix other) (Copy constructor)

Methods:
double getDeterminant()
boolean isSquareMatrix()
Matrix productOfMatrices(Matrix other)
boolean canBeAdded(Matrix other)
boolean canBeMultiplied(Matrix other)
boolean isInRowEchelonForm()
boolean isTriangleMatrix()
static Matrix generateRandomMatrix(int rows, int cols)
double[] getEigenvalues()
boolean isMatrixOrthogonal()
Vector getRowVector(int index)
Vector getColumnVector(int index)
Matrix transpose()
Matrix inverse() (If applicable, for non-singular matrices)
boolean isInvertible()
int getRank() (Calculate and return the rank)
boolean isDiagonalizable()
Matrix Diagonalize()
boolean isEqual(Matrix other)
multiply
add
subtract
scalar multiplication

2. Vector Class:

Methods:
double dotProduct(Vector other)
Vector crossProduct(Vector other)

double angleBetweenTwoVectors(Vector other)
double getMagnitude()
Vector normalize()