Computer Programming, Assignment 3

Monsoon 2021, IIIT-H
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This problem set is on numerical methods.

1 Basic Problems on Matrices

1. Write a program to compute the transpose of a given $n \times n$ square matrix in-place.
2. Write a program to compute the transpose of a given $m \times n$ rectangular matrix. Can you do the transpose operation in-place?
3. Write a program to compute the sum of two matrices.
4. Write a program to the compute the product of a $m \times n$ matrix A with a vector $n \times 1$.
5. Write a program to the compute the product of a $m \times n$ matrix A with a matrix $n \times p$ matrix B.

2 Roots of Equations

Use the following reference https://web.archive.org/web/20090413123941/http://numericalmethods.eng.usf.edu/topics/textbook_index.html.

1. Write a program to read a polynomial and pretty print it on the screen.
2. Write a program to rad a polymomial and pretty print its differential on the screen.
3. Write a program to evaluate the value of polynomial $p(x)$ at a given point a.
4. Write a program to evaluate the value of polynomial $p(x)$ at a given point a using Horner's method.
5. Write a program to read a quadratic equation and print its roots (even if they are complex).
6. Write a program to compute the root of a polynomial using **Bisection Method.**
7. Write a program to compute the root of a polynomial using **Newton-Raphson Method.**
8. Write a program to compute the root of a polynomial using **Secant Method.**

3 Simultaneous Linear Equations

1. Write a program to solve a system of linear equations using Gaussian Elimination method.
2. Write a program to compute the LU Decomposition of a matrix.
3. Write a program to solve a system of linear equations using Gauss-Siedel Method.
4. Write a program to compute using the power method to numerically find in magnitude the largest eigenvalue of a square matrix and the corresponding eigenvector.

4 Challenge Problems

1. Write a program to compute the determinant of a matrix.
2. Write a program to compute the permanent of a matrix.