

Control System Homework 1

1. Basic Arithmetic

Please calculate the following equation and store to variable $z1$

$$z1 = \frac{1}{2} \ln(x + \sqrt{1 + x^2}) + I$$

$$x = \begin{bmatrix} 2 & 1 + 2i \\ -0.45 & 5 \end{bmatrix}$$

I : identity matrix.

2. Matrix/Vector

We know that

$$A = \begin{bmatrix} 12 & 34 & -4 \\ 34 & 7 & 87 \\ 3 & 65 & 7 \end{bmatrix}$$

$$B = \begin{bmatrix} 1 & 4 & 7 \\ 2 & 5 & 8 \\ 3 & 6 & 9 \end{bmatrix}$$

Find

- (a) $z2 = A*B$,
- (b) $z3 = A.*B$
- (c) $z4 = A^3$,
- (d) $z5 = A.^3$
- (e) $z6 = [A([1,3],:);B^2]$
- (f) $z7 =$ a vector contains eigenvalues of B
- (g) $z8 =$ determinant of A

3. Equation Solving

$$\begin{bmatrix} 1/2 & 1/3 & 1/4 \\ 1/3 & 1/4 & 1/5 \\ 1/4 & 1/5 & 1/6 \end{bmatrix} \begin{bmatrix} x1 \\ x2 \\ x3 \end{bmatrix} = \begin{bmatrix} 0.95 \\ 0.67 \\ 0.52 \end{bmatrix}$$

Solve $x1, x2, x3$. Then change 0.52 to 0.53 and solve again.

4. Loop statement

Please create a 9*9 Hilbert matrix

Reference: https://en.wikipedia.org/wiki/Hilbert_matrix

5. Plot

Please plot the following equation in one figure, with eq1 on the left and eq2 on the right.

Eq1:

$$y1 = -\sqrt{\cos(x)} + 3, x \in \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$$

Eq2:

$$f(x, y) = \frac{x^2}{2^2} - \frac{y^2}{4^2}, (-2 \leq x \leq 2, -4 \leq y \leq 4)$$