

Math Question (equal weight each part)

Part 1

(a) Find the inverse of

$$\mathbf{M} = \begin{bmatrix} 1 & 2 \\ 3 & 2 \end{bmatrix}.$$

(b) Use the inverse to find \mathbf{x} if

$$\mathbf{M}\mathbf{x} = \mathbf{b}$$

where

$$\mathbf{b} = \begin{bmatrix} 8 \\ 4 \end{bmatrix}.$$

Part 2

Find all solutions for \mathbf{x} and λ to the following equation

$$\mathbf{N}\mathbf{x} = \lambda\mathbf{x}$$

where

$$N = \begin{bmatrix} 2 & 2 \\ 1 & 3 \end{bmatrix}.$$

Part 3

Find all steady-state solutions for $x(t)$ and λ to the following equation

$$Rx(t) = \lambda x(t)$$

where R is the derivative operator given by

$$R = \frac{d^2}{dt^2} - 4\frac{d}{dt} + 6$$