Math Question (equal weight each part)

Part 1

(a) Find the inverse of

\[
M = \begin{bmatrix} 1 & 2 \\ 3 & 2 \end{bmatrix}.
\]

(b) Use the inverse to find \( x \) if

\[ Mx = b \]

where

\[ b = \begin{bmatrix} 8 \\ 4 \end{bmatrix}. \]

Part 2

Find all solutions for \( x \) and \( \lambda \) to the following equation

\[ Nx = \lambda x \]

where

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

Part 3

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

\[ Rx(t) = \lambda x(t) \]

where \( R \) is the derivative operator given by

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