Practice Exam 2 - MATH 1502

Indicate your name and section. The exam will be closed book, closed notes and no calculators will be allowed. Show all your work.

Problem 1 (points): Find the equilibria and their stability of the equation \( \frac{dx}{dt} = (x + 1)x(x - 1) \).

Problem 2 (points): Solve the equation \( \frac{dx}{dt} = x^2 \cos t \) and \( x(0) = 1 \).

Problem 3 (points): Solve
\[
\begin{align*}
    x_2 - x_3 + 2x_4 &= 1 \\
    x_1 + 2x_2 + x_3 - x_4 &= 3 \\
    x_1 - x_2 + x_4 &= -2
\end{align*}
\]

Problem 4 (points): If possible, find the inverse of
\[
\begin{bmatrix}
    1 & 2 & 2 \\
    2 & 1 & -2 \\
    -2 & 2 & -1
\end{bmatrix}
\]

Problem 5 (points): Let
\[
A = \begin{bmatrix} 1 & 0 & -2 \\ 3 & -1 & 1 \end{bmatrix} \text{ and } B = \begin{bmatrix} 1 & -1 & 0 \\ 3 & -1 & 1 \\ 0 & 2 & -1 \end{bmatrix}
\]
Compute \( AB \).