Problem 1

Find a general solution to the system of differential equations

$$y_1' = y_1 + 2y_2$$
$$y_2' = 3y_1 + 2y_2$$

Problem 2

Solve the initial value problem for the system from problem 1: $y_1(0) = 1$ and $y_2(0) = 3$.

Problem 3

Solve the system $Y' = \begin{bmatrix} 1 & 3 & -3 \\ 0 & 1 & 0 \\ 6 & 3 & -8 \end{bmatrix} Y$.

Problem 4

Solve the above system with the initial conditions $Y(0) = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$.