Instructions: Answer the questions in the space provided. Show all work to receive partial credit if any. Unsupported work will receive no credit. Circle final answer.

Given the differential equation
\[ y' = 2y - 6 \quad \text{or} \quad \frac{dy}{dt} = 2y - 6. \]

(a) (1 point) Indicate if the equation is linear or nonlinear.
\[ \underline{\text{Linear}} \]

(b) (2 points) Find the equilibrium solution or state that there is no equilibrium solution.
\[ 2y - 6 = 0 \]
\[ \frac{y}{2} - 3 = 0 \]
\[ y = 3 \]
\[ y \neq 1 = 3 \]

(c) (5 points) Find the general solution. Make sure to show all work!
\[ y' = 2(y - 3) \]
\[ \frac{dy}{dx} = 2 \]
\[ y - 3 \]
\[ \ln |y - 3| = 2t + C \]
\[ y - 3 = e^{2t + C} \]
\[ y - 3 = \pm Ce^{2t} \]
\[ y = 3 + Ce^{2t} \]
\( y = 3 + Ce^{2t} \) is arbitrary
\( \text{(integrating factor also works)} \)

(d) (2 points) Find the solution with the initial conditions \( y(0) = 4 \) and indicate the behavior of the solution as \( t \to \infty \) (fill in the blank).
\[ y \to \infty \]
\[ \lim_{t \to \infty} 3 + e^{2t} = 3 + \infty = \infty \]
\[ y = 3 + Ce^{2t} \]
\[ y = 3 + Ce^{0} = 3 + C \]
\[ C = 1 \]
\[ y = 3 + e^{2t} \]
\[ y \to \infty \]