Solving Certain First-Order Systems of Differential Equations

Math 230

Use what you know about solving individual differential equations to solve the following systems of differential equations. Check that your answer is correct.

1. $\begin{cases} \frac{dx}{dt} = 3x \\ \frac{dy}{dt} = y + 2 \end{cases}$

2. $\begin{cases} \frac{dx}{dt} = 3x - 2y \\ \frac{dy}{dt} = 4y \end{cases}$

3. $\begin{cases} \frac{dx}{dt} = -2x \\ \frac{dy}{dt} = x^2 - 4y \end{cases}$ with $x(0) = 3$ and $y(0) = 5$

Approximating Solutions

Math 230

Consider the system of differential equations

$$\begin{cases} \frac{dx}{dt} = 3x - 2y \\ \frac{dy}{dt} = x + y \end{cases}$$

Suppose you know that $x(0) = 1$ and $y(0) = 0$. How could you approximate the coordinates of the point $(x(1), y(1))$? You might start with a vector plot, but try to think of a more precise method than drawing a curve on the plot.