

Math 1B: Discussion 4/2/19

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Question 1

Find the particular solution to

$$xy'' = 1$$

that satisfies $y(1) = 2$, $y'(1) = 1$.

Question 2

Check that $y = \frac{1}{C-x}$ is a solution to the following differential equation

$$y' - y^2 = 0$$

Find the particular solution such that $y(0) = 1/2$. Draw a direction field for this equation and graph the particular solution for it on top of the direction field.

Question 3

Check that $y = C_1e^{-x} + C_2xe^{-x}$ is a general solution to the differential equation

$$y'' + 2y' + y = 0$$

Find the particular solution that satisfies $y(0) = 1$, $y'(0) = -1$.

Question 4

Find a solution to each of the following differential equations.

$$y' = 2y$$

$$y' = \frac{1}{2y}$$

(Hint: For the second differential equation, try $y = x^k$ for some number k).

Find two linearly independent solutions to each of the following differential equations.

$$y'' - 9y = 0$$

$$y'' + 9y = 0$$

(Hint: Rewrite these as $y'' = 9y$ and $y'' = -9y$).

Question 5

Draw a direction field for the differential equations

$$\frac{dy}{dx} = x^2 + y, \quad \frac{dy}{dx} = \frac{y}{x}, \quad \frac{dy}{dx} = \frac{1}{x - y}$$

For the first two differential equations, use Euler's method with step size 0.5 to estimate $y(3)$ for the particular solution such that $y(1) = 1$.