
Math 2150 - Homework # 3 -

First order linear ODEs

1. Find all solutions to the given linear ODE on the given interval I .

(a) $y' - 2y = 1$ on $I = (-\infty, \infty)$

(b) $y' + 2xy = x$ on $I = (-\infty, \infty)$

(c) $\frac{dy}{dx} + 2xy = xe^{-x^2}$ on $I = (-\infty, \infty)$

(d) $y' + \frac{1}{x}y = 3x^2 - \frac{1}{x}$ on $I = (0, \infty)$

2. Find all solutions to the given linear ODE on the given interval I .

(a) $3\frac{dy}{dx} + y = 2e^{-x}$ on $I = (-\infty, \infty)$

(b) $x^2y' + x(x+2)y = e^x$ on $I = (0, \infty)$

(c) $(x^2 + 9)\frac{dy}{dx} + xy = 0$ on $I = (-\infty, \infty)$

3. Solve the initial value problem

$$\frac{dy}{dx} + 2xy = x, \quad y(0) = -3$$

on the interval $I = (-\infty, \infty)$.

4. Solve the initial value problem

$$xy' + y = 2x, \quad y(1) = 0$$

on the interval $I = (0, \infty)$.

5. In the problems above you showed that the general solution to

$$(x^2 + 9)\frac{dy}{dx} + xy = 0$$

on $I = (-\infty, \infty)$ is given by

$$y = \frac{C}{\sqrt{x^2 + 9}}$$

Use this information to solve the initial value problem

$$(x^2 + 9)\frac{dy}{dx} + xy = 0, \quad y(0) = 3$$

on the interval $I = (-\infty, \infty)$.
