

Linear First-Order Differential Equations

1. Find the general solution for the given differential equation. Give the largest interval where this solution is defined. Find any transient terms in the solution if they exist.

$$\frac{dy}{dx} + y = e^{3x}$$

2. Find the general solution for the given differential equation. Give the largest interval where this solution is defined. Find any transient terms in the solution if they exist.

$$y' + 3x^2y = x^2$$

3. Find the general solution for the given differential equation. Give the largest interval where this solution is defined. Find any transient terms in the solution if they exist.

$$x^2y' + xy = 1$$

4. Find the general solution for the given differential equation. Give the largest interval where this solution is defined. Find any transient terms in the solution if they exist.

$$x \frac{dy}{dx} - y = x^2 \sin(x)$$

5. Find the solution for the given initial-value problem. Give the largest interval where this solution is defined.

$$xy' + y = e^x, y(1) = 2$$

6. Find the solution for the given initial-value problem. Give the largest interval where this solution is defined.

$$x \frac{dy}{dx} + y = 4x + 1, y(1) = 4$$

7. Find the general solution for the given differential equation. Give the largest interval where this solution is defined. Find any transient terms in the solution if they exist.

$$x^2y' + x(x+2)y = e^x$$

8. Find the general solution for the given differential equation. Give the largest interval where this solution is defined. Find any transient terms in the solution if they exist.

$$\cos(x) \frac{dy}{dx} + (\sin(x))y = 1$$

9. Find the general solution for the given differential equation. Give the largest interval where this solution is defined. Find any transient terms in the solution if they exist.

$$x \frac{dy}{dx} + (3x + 1)y = e^{-3x}$$