In Problems 1–24 find the general solution of the given differential equation. Give the largest interval I over which the general solution is defined. Determine whether there are any transient terms in the general solution.

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

4.
$$3\frac{dy}{dx} + 12y = 4$$

7.
$$x^2y' + xy = 1$$

8.
$$y' = 2y + x^2 + 5$$

11.
$$x\frac{dy}{dx} + 4y = x^3 - x$$

15.
$$ydx - 4(x + y^6)dy = 0$$

16.
$$ydx = (ye^y - 2x)\,dy$$

Problems 25–36 solve the given initial-value problem. Give the largest interval I over which the solution is defined.

25.
$$\frac{dy}{dx} = x + 5y, y(0) = 3$$

26.
$$\frac{dy}{dx} = 2x - 3y, y(0) = \frac{1}{3}$$