

## Problem 6

In each of Problems 1 through 8, find the general solution of the given differential equation.

$$4y'' - 9y = 0$$

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### Solution

Since this is a linear homogeneous constant-coefficient ODE, the solution is of the form  $y = e^{rt}$ .

$$y = e^{rt} \quad \rightarrow \quad y' = re^{rt} \quad \rightarrow \quad y'' = r^2e^{rt}$$

Substitute these expressions into the ODE.

$$4(r^2e^{rt}) - 9(e^{rt}) = 0$$

Divide both sides by  $e^{rt}$ .

$$4r^2 - 9 = 0$$

$$(2r + 3)(2r - 3) = 0$$

$$r = \left\{ -\frac{3}{2}, \frac{3}{2} \right\}$$

Two solutions to the ODE are  $y = e^{-3t/2}$  and  $y = e^{3t/2}$ . Therefore, the general solution is

$$y(t) = C_1e^{-3t/2} + C_2e^{3t/2},$$

a linear combination of the two.