2019 Q8

8. Find the particular solution of the differential equation

\[
\frac{d^2y}{dx^2} + 11 \frac{dy}{dx} + 28y = 0
\]

given that \(y = 0\) and \(\frac{dy}{dx} = 9\), when \(x = 0\).

Answer

- 1 solve auxiliary equation
- 2 state general solution
- 3 differentiate
- 4 form equations and solve for a constant
- 5 find second constant and state particular solution

\[
\begin{align*}
\bullet 1 & \quad m = -4, -7 \\
\bullet 2 & \quad y = Ae^{-4x} + Be^{-7x} \\
\bullet 3 & \quad \frac{dy}{dx} = -4Ae^{-4x} - 7Be^{-7x} \\
\bullet 4 & \quad A = 3 \text{ or } B = -3 \\
\bullet 5 & \quad y = 3e^{-4x} - 3e^{-7x}
\end{align*}
\]