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Instructor: Muhammad Awais	**Book:** Thomas' Calculus Early Transcendentals, 14e
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Check whether each of the following functions is a solution of the differential equation $5y' + 11y = 6e^{-x}$.

(a) $y = e^{-x}$ **(b)** $y = e^{-x} + e^{-(11/5)x}$
(c) $y = e^{-x} + Ce^{-(11/5)x}$

If u is any differentiable function of x, then $\frac{d}{dx}\left(e^{u}\right) = e^{u}\frac{du}{dx}$.

(a) For $y = e^{-x}$ find y'.

$$\begin{aligned} y' &= \frac{d}{dx}e^{-x} \\ &= -e^{-x} \end{aligned}$$

Find $5y'$, $11y$, and $5y' + 11y$ for $y = e^{-x}$ given that $y' = -e^{-x}$.

$$\begin{aligned} 5y' &= -5e^{-x} \\ 11y &= 11e^{-x} \\ 5y' + 11y &= 6e^{-x} \end{aligned}$$

The function $y = e^{-x}$ is a solution of $5y' + 11y = 6e^{-x}$.

(b) For $y = e^{-x} + e^{-(11/5)x}$, find y'.

$$\begin{aligned} y' &= \frac{d}{dx}(e^{-x} + e^{-(11/5)x}) \\ &= -e^{-x} - \frac{11}{5}e^{-(11/5)x} \end{aligned}$$

Find $5y'$, $11y$, and $5y' + 11y$ for $y = e^{-x} + e^{-(11/5)x}$ given $y' = -e^{-x} - \frac{11}{5}e^{-(11/5)x}$.

$$\begin{aligned} 5y' &= -5e^{-x} - 11e^{-(11/5)x} \\ 11y &= 11e^{-x} + 11e^{-(11/5)x} \\ 5y' + 11y &= 6e^{-x} \end{aligned}$$

The function $y = e^{-x} + e^{-(11/5)x}$ is a solution of $5y' + 11y = 6e^{-x}$.

(c) For $y = e^{-x} + Ce^{-(11/5)x}$, find y'.

$$\begin{aligned} y' &= \frac{d}{dx}(e^{-x} + Ce^{-(11/5)x}) \\ &= -e^{-x} - \frac{11}{5}Ce^{-(11/5)x} \end{aligned}$$

Find $5y'$, $11y$, and $5y' + 11y$ for $y = e^{-x} + Ce^{-(11/5)x}$ given
$y' = -e^{-x} - \frac{11}{5}Ce^{-(11/5)x}$.

$$\begin{aligned} 5y' &= -5e^{-x} - 11Ce^{-(11/5)x} \\ 11y &= 11e^{-x} + 11Ce^{-(11/5)x} \\ 5y' + 11y &= 6e^{-x} \end{aligned}$$

The function $y = e^{-x} + Ce^{-(11/5)x}$ is a solution of $5y' + 11y = 6e^{-x}$.