How to Check Your Answer

While it may be difficult to solve a differential equation, it is fairly easy to see if a proposed solution is correct. Check the following results by plugging the proposed answer into the original equation.

a) $y = \dfrac{1}{3}e^x$ is a solution to $4y'' - y = e^x$.

b) $y = \dfrac{1}{x}$ is a solution to $x^2 \dfrac{d^2 y}{dx^2} + 3x \dfrac{dy}{dx} + y = 0$.

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a) $4y'' - y = e^x$

$\qquad y = \frac{1}{3}e^x$

$4\left(\frac{e^x}{3}\right) - \left(\frac{1}{3}e^x\right)$

$\Rightarrow y' = \frac{1}{3}e^x, \ y'' = \frac{1}{3}e^x$

$= e^x$

$\therefore y = \frac{1}{3}e^x$ is a solution.

b) $x^2 \frac{d^2y}{dx^2} + 3x \frac{dy}{dx} + y = 0$

$\qquad y = \frac{1}{x}$

$x^2\left(\frac{2}{x^3}\right) + 3x\left(-\frac{1}{x^2}\right) + \left(\frac{1}{x}\right)$

$y' = -\frac{1}{x^2}, \ y'' = \frac{2}{x^3}$

$= \frac{2}{x} - \frac{3}{x} + \frac{1}{x}$

$= 0$

$\therefore y = \frac{1}{x}$ is a solution.

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