Solution to an ODE

Quiz: Solution to an ODE.
Which of the following is a solution to the ODE $dy/dx = 2y + 1$?

Choices:

a) $y = ce^{2x} - 1$.

b) $y = x^2 + x + c$.

c) $y = e^{x/2} + c$.

d) $y = ce^{2x} - 1/2$.

e) $y = e^{2x} + c$.

f) None of the above

Answer: (d)

This is a little long because at this point our only strategy is to check each potential solution by substitution. (We will remedy that soon!) Briefly:

a) Left side: $dy/dx = 2ce^{2x}$. Right side: $2y + 1 = 2ce^{2x} - 2 + 1 = 2ce^{2x} - 1$. $\Rightarrow$ Not equal.

b) Left side: $dy/dx = 2x + 1$. Right side: $2y + 1 = 2x^2 + 2x + 2c + 1$. $\Rightarrow$ Not equal.

c) Left side: $dy/dx = \frac{1}{2}e^{x/2}$. Right side: $2y + 1 = 2e^{x/2} + 2c + 1$. $\Rightarrow$ Not equal.

d) Left side: $dy/dx = 2ce^{2x}$. Right side: $2y + 1 = 2ce^{2x} - 1 + 1 = 2ce^{2x}$. $\Rightarrow$ Equal! This is the answer.

e) Left side: $dy/dx = 2e^{2x}$. Right side: $2y + 1 = 2e^{2x} + 2c + 1$. $\Rightarrow$ Not equal.

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