

Separation of Variables

Quiz: Separation of Variables.

What is the general solution to the ODE $dy/dx = 2y + 1$? (Use separation of variables.)

Choices:

- a) $y = Ce^{2x} - 1$.
- b) $y = Ce^{x/2} - 2$.
- c) $x = y^2 + y + C$.
- d) $y = e^{x/2} + C$.
- e) $y = Ce^{2x} + 1$.
- f) $y = Ce^{2x} - 1/2$.
- g) $y = e^{2x} + C$.
- h) None of the above.

Answer:

Separate variables: $dy/(2y + 1) = dx$

Integrate both sides: $(1/2)\ln|2y + 1| + c_1 = x + c_2$.

Amalgamate the constants: $\ln|2y + 1| = 2x + c_3$.

Exponentiate and solve (if possible) for y in terms of x :

$$|2y + 1| = e^{c_3} e^{2x} \Rightarrow 2y + 1 = Ce^{2x} \Rightarrow y = Ce^{2x} - 1/2.$$

So the answer is: (f)

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