



Wolfram|Alpha Step-by-Step Solution

Wolfram|Alpha Input:

STEP 1

Solve the linear equation $\frac{dy(x)}{dx} - y(x) = e^{2x} (5x + 3)$:

STEP 2

Let $\mu(x) = e^{\int -1 dx} = e^{-x}$.

Multiply both sides by $\mu(x)$:

$$e^{-x} \frac{dy(x)}{dx} - e^{-x} y(x) = e^x (5x + 3)$$

STEP 3

Substitute $-e^{-x} = \frac{d}{dx}(e^{-x})$:

$$e^{-x} \frac{dy(x)}{dx} + \frac{d}{dx}(e^{-x}) y(x) = e^x (5x + 3)$$

STEP 4

Apply the reverse product rule $f \frac{dg}{dx} + g \frac{df}{dx} = \frac{d}{dx}(fg)$ to the left-hand side:

$$\frac{d}{dx}(e^{-x} y(x)) = e^x (5x + 3)$$

STEP 5

Integrate both sides with respect to x :

$$\int \frac{d}{dx}(e^{-x} y(x)) dx = \int e^x (5x + 3) dx$$

STEP 6

Evaluate the integrals:

$$e^{-x} y(x) = e^x (5x - 2) + c_1, \text{ where } c_1 \text{ is an arbitrary constant.}$$

STEP 7

Divide both sides by $\mu(x) = e^{-x}$:

Answer:

$$y(x) = e^x (e^x (5x - 2) + c_1)$$



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