Wolfram|Alpha Step-by-Step Solution

Wolfram|Alpha Input:

STEP 1

Solve the linear equation $\frac{d\,y(x)}{d\,x} - y(x) = e^{2\,x}\,x$:

STEP 2

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

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

$$e^{-x}\,\frac{d\,y(x)}{d\,x} - e^{-x}\,y(x) = e^{x}\,x$$

STEP 3

Substitute $-e^{-x} = \frac{d}{d\,x}\left(e^{-x}\right)$:

$$e^{-x}\,\frac{d\,y(x)}{d\,x} + \frac{d}{d\,x}\left(e^{-x}\right)y(x) = e^{x}\,x$$

STEP 4

Apply the reverse product rule $f\,\frac{d\,g}{d\,x} + g\,\frac{d\,f}{d\,x} = \frac{d}{d\,x}(f\,g)$ to the left-hand side:

$$\frac{d}{d\,x}\left(e^{-x}\,y(x)\right) = e^{x}\,x$$

STEP 5

Integrate both sides with respect to x:

$$\int \frac{d}{d\,x}\left(e^{-x}\,y(x)\right)d\,x = \int e^{x}\,x\,d\,x$$

STEP 6

Evaluate the integrals:

$e^{-x}\,y(x) = e^{x}\,(x-1) + c_1$, where c_1 is an arbitrary constant.

STEP 7

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

Answer:

$$y(x) = e^x \left(e^x (x - 1) + c_1\right)$$

Generated by Wolfram|Alpha (www.wolframalpha.com) on June 21, 2020 from Champaign, IL.