

Problem Definition

Problem 25. Match the solution of the differential equation in the text to the following differential equation.

$$y' - 2xy = 0$$

Solution Step 1:

Instead of just matching the solution, let's actually compute the solution using integrating factors. The process begins by computing the integrating factor. The formula for the integrating factor is

$$u(x) = e^{\int P(x)dx}$$

where in this problem $P(x) = -2x$.

$$\int P(x)dx = \int (-2x)dx = -x^2$$

Then

$$u(x) = e^{-x^2}$$

Solution Step 2:

Once the integrating factor is known we can compute the solution using the formula.

$$y(x) = \frac{1}{u(x)} \int Q(x)u(x)dx$$

where in this problem $Q(x) = 0$.

$$\begin{aligned} \int Q(x)u(x)dx &= \int (0)e^{-x^2} dx \\ &= \int (0)dx \\ &= C \end{aligned}$$

Since the derivative of any constant is zero.

Solution Step 3:

Now that we have the pieces, the solution is

$$\begin{aligned}y(x) &= \frac{1}{e^{-x^2}}(C) \\ &= Ce^{x^2}\end{aligned}$$

In the textbook this is solution (a) in the list of solutions in the right hand column.