

Answer on Question #74736 – Math – Calculus

Question

Evaluate integration of $(1 + t)^3 e^t$, t is decreasing from x to -1 .

Solution

Evaluate integration of $(1 + t)^3 e^t$, t is decreasing from x to -1 .

Let's use formula $\int_a^b u \cdot dv = (u \cdot v)|_a^b - \int_a^b v \cdot du$

$$\begin{aligned} & - \int_{-1}^x (1 + t)^3 e^t dt = \int_{-1}^x -(1 + t)^3 e^t dt = \\ & = [u = -(1 + t)^3; dv = e^t dt; du = -3(1 + t)^2 dt; v = e^t] = \\ & = -(1 + x)^3 e^x + \int_{-1}^x 3(1 + t)^2 e^t dt = \\ & = [u = 3(1 + t)^2; dv = e^t dt; du = 6(1 + t) dt; v = e^t] = \\ & = -(1 + x)^3 e^x + 3(1 + x)^2 e^x - \int_{-1}^x 6(1 + t) e^t dt = \\ & = [u = 6(1 + t); dv = e^t dt; du = 6 dt; v = e^t] = \\ & = -(1 + x)^3 e^x + 3(1 + x)^2 e^x - (6(1 + x) e^x - \int_{-1}^x 6 e^t dt) = \\ & = -(1 + x)^3 e^x + 3(1 + x)^2 e^x - 6(1 + x) e^x + \int_{-1}^x 6 e^t dt = \\ & = -(1 + x)^3 e^x + 3(1 + x)^2 e^x - 6(1 + x) e^x + 6e^x - 6e^{-1} = \\ & = e^x(-1 - 3x - 3x^2 - x^3 + 3 + 6x + 3x^2 - 6 - 6x + 6) - \frac{6}{e} = \\ & = e^x(2 - 3x - x^3) - \frac{6}{e} \end{aligned}$$

Answer: $e^x(2 - 3x - x^3) - \frac{6}{e}$

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