

Answer on Question #79081 – Math – Calculus Question

Find the intervals in R over which integration of $(t + 1)^3 e^t dt$ within limit -1 to x is decreasing.

Solution

Use the second fundamental theorem of calculus.

If f is continuous on open interval I containing a , then for every x in the interval:

$$\frac{d}{dx} \left[\int_a^x f(t) dt \right] = F'(x) = f(x)$$

Then

$$\frac{d}{dx} \left[\int_{-1}^x (t + 1)^3 e^t dt \right] = (x + 1)^3 e^x$$

If $(x + 1)^3 e^x < 0$, then $\frac{d}{dx} \left[\int_{-1}^x (t + 1)^3 e^t dt \right] < 0$ and $\int_{-1}^x (t + 1)^3 e^t dt$ is decreasing.

$$(x + 1)^3 e^x < 0 \Rightarrow x < -1$$

$$x \in (-\infty, -1)$$

Answer: $x \in (-\infty, -1)$.