Resolved Unresolved @84_f2

4 weeks ago

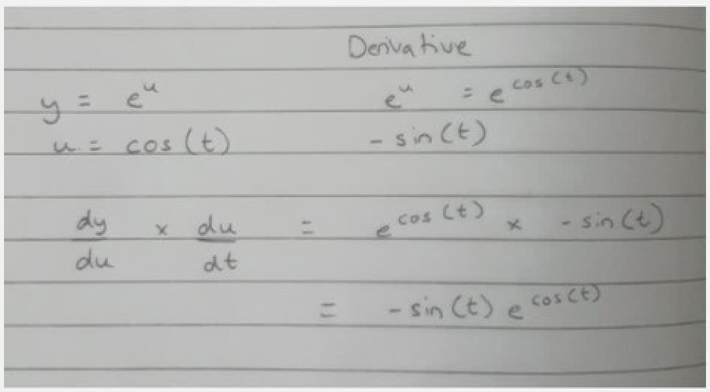
For p) the rules for derivatives says the derivative of e^x is e^x so would the derivative of $e^{cos(t)}$ be $e^{cos(t)}$? Or am I missing a step?

helpful! | 0

Nandini Bhat 4 weeks ago

Actions

I think this situation is different because the exponent also a function. So $e^{cos(t)}$ becomes two functions put together, which is when we use the chain rule. Attaching a picture of my answer below:



Derivative

$y = e^u$ $\quad$ $e^u = e^{\cos(t)}$

$u = \cos(t)$ $\quad$ $-\sin(t)$

$$\frac{dy}{du} \times \frac{du}{dt} = e^{\cos(t)} \times -\sin(t)$$

$$= -\sin(t)\, e^{\cos(t)}$$

The final answer I got is $-sin(t)e^{cos(t)}$.

helpful! | 0

3 weeks ago

So where does the constant 6 go? I think I am a little confused how the e stays the same.

helpful! | 0

3 weeks ago

The 6 from the original problem does stay, but I think this post is specifically focused on the calculation for plain e^cos(t). I'm afraid I can't help with why the derivative of e^x is e^x…e is magic? It's certainly nice though.

helpful! | 0

Nandini Bhat 3 weeks ago

Actions

Oh, sorry! I only gave the answer for that specific part of the numerator. The derivative of the numerator $6e^{cos(t)}$ is $-6sin(t)e^{cos(t)}$, taking the 6 into account as well. The reason the e remains the same is that e^x is a function in itself. This means we have two compounded functions $f(x) = e^x$ and $g(t) = cos(t)$. We use the chain rule in this situation, which states that the derivative of two compounded functions is $f'(g(t)) \cdot g'(t)$. So we first find $f'(g(t))$:

$f'(g(t)) = f'(cos(t)) = e^{cos(t)}$ (Exponent rule)
$g'(t) = g'(cos(t)) = -sin(t)$ (Derivative of cos(x) = -sin(x))
$f'(g(t)) \cdot g'(t) = e^{cos(t)} \cdot -sin(t) = -sin(t)e^{cos(t)}$ (Chain rule using our previous work)

Because the 6 was a coefficient in the term, it stays in the derivative, becoming $-6sin(t)e^{cos(t)}$.

If I've messed up anything here, please let me know! I get really muddled up with the chain rule sometimes and I think it shows in my explanations too.

helpful! | 0