Practicing the product rule

Practice Quiz, 6 questions

5/6 points (83.33%)

Congratulations! You passed!

Next Item

1 / 1
point

1.
In this quiz you'll have some practice using the product rule alongside the rules you've already learned.

In the previous video we considered the product of two functions, $A(x) = f(x)g(x)$, and saw that its derivative is given by $A'(x) = f'(x)g(x) + f(x)g'(x)$.

Which of the following is the product rule in $\frac{d}{dx}$ notation?

- $\frac{dA(x)}{dx} = \frac{df(x)}{dx}g(x) - f(x)\frac{dg(x)}{dx}$
- $\frac{dA(x)}{dx} = \frac{df(x)}{dx}\frac{dg(x)}{dx} + f(x)g(x)$
- $\frac{dA(x)}{dx} = \frac{df(x)}{dx}g(x) + f(x)\frac{dg(x)}{dx}$

Correct
It's useful to be able to translate between these different notations as you will see both in the real world.

- $\frac{dA(x)}{dx} = \frac{df(x)}{dx}\frac{dg(x)}{dx}$

0 / 1
point

2.
When using the product rule it may help to consider how the function can be broken up into two parts, which can then be labelled $f(x)$ and $g(x)$. Use this method to differentiate the function $A(x) = (x+2)(3x-3)$ with respect to x.

- $A'(x) = 3x + 3$
- $A'(x) = 6x + 3$
- $A'(x) = 3x + 6$
- $A'(x) = 3$

This should not be selected

Here you can write $f(x) = (x + 2)$ and $g(x) = (3x - 3)$ and apply the product rule.

Practicing the product rule

Practice Quiz, 6 questions

5/6 points (83.33%)

---

1 / 1 point

3.

Remember that how we choose to label the function, $A(x)$ or $u(x)$ or $f(x)$, is not important. The key is to see if the function can be written as a product of two functions, and if so, use the product rule.

Differentiate the function $f(x) = x^3 \sin(x)$ with respect to x.

- $f'(x) = 3x^2 \sin(x) - x^3 \cos(x)$
- $f'(x) = 3x^2 \sin(x) + x^3 \cos(x)$

Correct

You identified the two functions as x^3 and $\sin(x)$ and applied the product rule correctly.

- $f'(x) = x^3 \sin(x) - 3x^2 \cos(x)$
- $f'(x) = x^3 \sin(x) + 3x^2 \cos(x)$

---

1 / 1 point

4.

Using the same approach, differentiate the function $f(x) = \frac{e^x}{x}$ with respect to x.

- $f'(x) = -\frac{e^x}{x^2}$
- $f'(x) = e^x \left(\frac{1}{x} - \frac{1}{x^2}\right)$

Correct

You identified the two functions, e^x and $\frac{1}{x}$, and applied the product rule correctly.

- $f'(x) = e^x \left(\frac{1}{x} + \frac{1}{x^2}\right)$
- $f'(x) = \frac{e^x}{x}$

---

1 / 1 point

5.

We can extend the product rule to products of more than two functions.

Practicing the product rule

Practice Quiz, 6 questions

5/6 points (83.33%)

Consider the function $u(x) = f(x)g(x)h(x)$. Substitute $A(x) = f(x)g(x)$ and then use the product rule *twice* to find the expression for $u'(x)$. This is the product rule for a product of three functions!

- $u'(x) = f'(x)g(x)h(x) + f(x)g'(x)h(x) + f(x)g(x)h'(x)$

Correct
You might be able to see from this how the product rule can be extended to as many functions as necessary.

- $u'(x) = f'(x)g'(x)h'(x)$
- $u'(x) = f(x)g(x)h'(x) + f'(x)g'(x)h(x)$
- $u'(x) = [f'(x)g(x) + f(x)g'(x)]\, h'(x)$

1 / 1
point

6.
Using your answer to the previous question, differentiate the function $f(x) = xe^x \cos(x)$ with respect to x.

- $f'(x) = -(1+x)e^x \sin(x)$
- $f'(x) = e^x(x\cos(x) - \sin(x))$
- $f'(x) = -e^x \sin(x)$
- $f'(x) = e^x[(x+1)\cos(x) - x\sin(x)]$

Correct
You spotted that the functions are x, e^x and $\cos(x)$, then applied the product rule correctly.