1. Question Details

Find all the following basic derivatives. Any letter other than $x$ is a constant. This is a complete list of the basic derivatives covered so far.

\[
\begin{align*}
\frac{d}{dx}(C) &= \\
\frac{d}{dx}(x^n) &= \\
\frac{d}{dx}(e^x) &= \\
\frac{d}{dx}(\sin(x)) &= \\
\frac{d}{dx}(\cos(x)) &= \\
\frac{d}{dx}(\ln(x)) &= \\
\end{align*}
\]

2. Question Details

Follow the steps to find the derivative of the function $f(x) = x^2 \ln(x)$

a. Identify this function as a product of two functions.
   - Left Factor: $u = x^2$
   - Right Factor: $v = \ln(x)$

b. Find the derivative of each factor.

\[
\begin{align*}
\frac{du}{dx} &= \\
\frac{dv}{dx} &= \\
\end{align*}
\]

c. Use the product rule

\[
\frac{d}{dx}(u \cdot v) = \frac{du}{dx} \cdot v + \frac{dv}{dx} \cdot u
\]

to find the derivative of the product.

\[
\frac{d}{dx}(x^2 \ln(x)) = \\
\]
3. Question Details

Follow the steps to find the derivative of the function

\[ f(x) = (3x - x^2)e^{5x} \]

a. This function is a product of two functions. Identify the left and right factors.

Left Factor: \( u = \) 
Right factor: \( v = \)

Note: In this problem you must use the Left and Right factors based on how the function is written above. In general you can identify the factors in any order.

b. Find the derivative of each factor.

\[ \frac{du}{dx} = \] 
\[ \frac{dv}{dx} = \]

c. Use the product rule

\[ \frac{d}{dx}\left( u \cdot v \right) = \frac{du}{dx} \cdot v + \frac{dv}{dx} \cdot u \]

to find the derivative of the product.

\[ \frac{d}{dx}\left( (3x - x^2)e^{5x} \right) = \]

4. Question Details

Follow the steps to find the derivative of the function

\[ f(x) = e^{-0.1x}\cos(1.3x + 2.7) \]

a. This function is a product of two functions. Identify the left and right factors.

Left Factor: \( u = \) 
Right factor: \( v = \)

Note: In this problem you must use the Left and Right factors based on how the function is written above. In general you can identify the factors in any order.

b. Find the derivative of each factor.

\[ \frac{du}{dx} = \] 
\[ \frac{dv}{dx} = \]

c. Use the product rule

\[ \frac{d}{dx}\left( u \cdot v \right) = \frac{du}{dx} \cdot v + \frac{dv}{dx} \cdot u \]

to find the derivative of the product.

\[ \frac{d}{dx}\left( e^{-0.1x}\cos(1.3x + 2.7) \right) = \]
5. Question Details

Use the product rule to find the following derivative.

\[
\frac{d}{dx}(3x^2 - 7x + 2)(5x - 11x^3) = \]

6. Question Details

Use the product rule to find the following derivative.

\[
\frac{d}{dx}(x^{-5} \ln(x)) = \]

7. Question Details

Use the product rule to find the following derivative. \( A \) and \( k \) are constants.

\[
\frac{d}{dx}(Ae^{-kx}) = \]

8. Question Details

Follow the steps to find the derivative of the function

\[ f(x) = \tan(x) = \frac{\sin(x)}{\cos(x)} \]

a. Identify this function as a quotient of two functions.

Numerator (Top): \( u = \sin(x) \)
Denominator (Bottom): \( v = \cos(x) \)

b. Find the derivative of each, the numerator and the denominator.

\[
\frac{du}{dx} = \]

\[
\frac{dv}{dx} = \]

c. Use the quotient rule

\[
\frac{d}{dx} \left( \frac{u}{v} \right) = \frac{\frac{du}{dx}v - \frac{dv}{dx}u}{v^2} \]

to find the derivative of the quotient.

\[
\frac{d}{dx}(\tan(x)) = \]

d. Simplify your answer using basic trigonometric identities.

\[
\frac{d}{dx}(\tan(x)) = \]
9. Question Details

Follow the steps to find the derivative of the function

\[ f(x) = \frac{150e^{0.1x}}{3 + e^{0.1x}} \]

a. This function is a quotient of two functions. Identify the numerator and denominator.

Numerator (Top): \( u = \)

Denominator (Bottom): \( v = \)

b. Find the derivative of each, the numerator and the denominator.

\[ \frac{du}{dx} = \]

\[ \frac{dv}{dx} = \]

c. Use the quotient rule

\[ \frac{d}{dx} \left( \frac{u}{v} \right) = \frac{du}{dx} \cdot v - \frac{dv}{dx} \cdot u \]

\[ v^2 \]

to find the derivative of the quotient.

\[ \frac{d}{dx} \left( \frac{150e^{0.1x}}{3 + e^{0.1x}} \right) = \]

10. Question Details

Follow the steps to find the derivative of the function

\[ f(x) = \frac{\ln(x)}{x^3} \]

a. This function is a quotient of two functions. Identify the numerator and denominator.

Numerator (Top): \( u = \)

Denominator (Bottom): \( v = \)

b. Find the numerator and denominator derivatives.

\[ \frac{du}{dx} = \]

\[ \frac{dv}{dx} = \]

c. Use the quotient rule

\[ \frac{d}{dx} \left( \frac{u}{v} \right) = \frac{du}{dx} \cdot v - \frac{dv}{dx} \cdot u \]

\[ v^2 \]

to find the derivative of the quotient.

\[ \frac{d}{dx} \left( \frac{\ln(x)}{x^3} \right) = \]
11. Use the quotient rule to find the following derivative.

\[
\frac{d}{dx}\left(\frac{x^2}{9 + x^2}\right) = \_\_\_\_\_\_\_
\]

12. Use the quotient rule to find the following derivative.

\[
\frac{d}{dx}\left(\cot(x)\right) = \frac{d}{dx}\left(\frac{\cos(x)}{\sin(x)}\right) = \_\_\_\_\_\_
\]

**Warning!** You must simplify your answer using basic trigonometric identities to get it marked correct.

13. Use the quotient rule to find the following derivative. Any letter other than \(x\) is constant.

\[
\frac{d}{dx}\left(\frac{ax + b}{a^2x^2 + b^2}\right) = \_\_\_\_\_\_
\]

14. Consider the function

\[f(x) = x^2 e^{-x}\]

a. Which of the following derivative rules is appropriate?

- [ ] Product Rule
- [ ] Quotient Rule
- [ ] Chain Rule

b. Find the derivative of this function.

\[f'(x) = \_\_\_\_\_\_\_\_
\]

https://www.webassign.net/v4cgi/assignments/preview.pl?aid=10862446&deployment=16439840&UserPass=78cd6de19d27731207184138c3bc8d8e
15. Question Details
Consider the function
\[ f(x) = \sqrt{9 - x^2} \]
a. Which of the following derivative rules is appropriate?
- Product Rule
- Quotient Rule
- Chain Rule
b. Find the derivative of this function.
\[ f'(x) = \]

16. Question Details
Consider the function
\[ f(x) = \frac{20\sin(3x)}{1 + x^2} \]
a. Which of the following derivative rules is appropriate?
- Product Rule
- Quotient Rule
- Chain Rule
b. Find the derivative of this function.
\[ f'(x) = \]

17. Question Details
Consider the function
\[ f(x) = x \ln(x) \]
a. Which of the following derivative rules is appropriate?
- Product Rule
- Quotient Rule
- Chain Rule
b. Find the derivative of this function.
\[ f'(x) = \]
18. Question Details

Consider the function
\[ f(x) = \sin(1 - 2x) \]

a. Which of the following derivative rules is appropriate?
   - Product Rule
   - Quotient Rule
   - Chain Rule

b. Find the derivative of this function.
\[ f'(x) = \]

19. Question Details

Consider the function
\[ f(x) = x^2 \cos(x) \]

a. Which of the following derivative rules is appropriate?
   - Product Rule
   - Quotient Rule
   - Chain Rule

b. Find the derivative of this function.
\[ f'(x) = \]

20. Question Details

Consider the function
\[ f(x) = \frac{\ln(x+1)}{(2-3x)^2} \]

a. Which of the following derivative rules is appropriate?
   - Product Rule
   - Quotient Rule
   - Chain Rule

b. Find the derivative of this function.
\[ f'(x) = \]
21. Question Details

Find the following derivative.

\[ \frac{d}{dx} \left( \frac{\sin(5 + 4x)}{e^{3x} - 4x} \right) = \]

22. Question Details

Find the following derivative. Assume any letter except \( x \) is constant.

\[ \frac{d}{dx} \left( (ax + b) \ln(1 + cx^2) \right) = \]