

Exponential and Logarithmic Derivatives

Differentiate directly, show the rule structure, and state the real domain for logarithmic expressions.

1. Differentiate $y=(4^x)/x$.

2. Differentiate $y=x^3 \ln(x+3)$. Domain: $x>-3$.

Exponential and Logarithmic Derivatives

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3. Differentiate $y=(\ln(x+8))/x$. Domain: $x>-8$.

4. Differentiate $y=x^3 7^x$.

Exponential and Logarithmic Derivatives

Differentiate directly, show the rule structure, and state the real domain for logarithmic expressions.

5. Differentiate $y = e^{(12x+5)}$.

6. Differentiate $y = \ln(11x+11)$ and state its real domain.

Exponential and Logarithmic Derivatives

Worked Answer Key

Differentiate directly, show the rule structure, and state the real domain for logarithmic expressions.

1. Differentiate $y=(4^x)/x$.

Answer: $y'=[x(\ln(4)4^x)-4^x]/x^2$

1. Numerator $u=4^x$, denominator $v=x$.

2. Use $(u'v-uv')/v^2$ with $u'=\ln(4)4^x$; also $x \neq 0$.

2. Differentiate $y=x^3 \ln(x+3)$. Domain: $x>-3$.

Answer: $y'=3x^2(\ln(x+3))+x^3(1/(x+3))$; domain $x>-3$.

1. Let $u=x^3$, $v=\ln(x+3)$.

2. $u'=3x^2$, $v'=1/(x+3)$; apply $u'v+uv'$.

Exponential and Logarithmic Derivatives

Worked Answer Key

Differentiate directly, show the rule structure, and state the real domain for logarithmic expressions.

3. Differentiate $y = (\ln(x+8))/x$. Domain: $x > -8$.

Answer: $y' = [x(1/(x+8)) - \ln(x+8)]/x^2$; domain $x > -8, x \neq 0$.

1. Numerator $u = \ln(x+8)$, denominator $v = x$.
2. Use $(u'v - uv')/v^2$ with $u' = 1/(x+8)$; also $x \neq 0$.

4. Differentiate $y = x^3 7^x$.

Answer: $y' = 3x^2(7^x) + x^3(\ln(7)7^x)$

1. Let $u = x^3$, $v = 7^x$.
2. $u' = 3x^2$, $v' = \ln(7)7^x$; apply $u'v + uv'$.

Exponential and Logarithmic Derivatives

Worked Answer Key

Differentiate directly, show the rule structure, and state the real domain for logarithmic expressions.

5. Differentiate $y = e^{(12x+5)}$.

Answer: $y' = 12e^{(12x+5)}$.

1. $u=12x+5$, so $u'=12$.

2. $d(e^u)/dx = e^u u'$.

6. Differentiate $y = \ln(11x+11)$ and state its real domain.

Answer: $y' = 11/(11x+11)$; domain $x > -11/11$.

1. $u=11x+11>0$, so $x>-11/11$.

2. $d(\ln u)/dx = u'/u$.