3.9b Derivatives of logarithms

Properties of Logs:

$y = \log_b x \qquad b^y = x$

$y = \ln x$ means

$y = \log_{10} x$

$\ln e =$

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$\log(ab) =$

$\log\left(\frac{a}{b}\right) =$

$\log a^n =$

$\ln e^x =$

$e^{\ln x} =$

$e^{\ln 5} =$

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Derivative of $y = \ln(x)$

means

general:

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Find $\frac{dy}{dx}$

1. $y = \ln(2x)$

2. $y = \ln\left(\frac{3}{x}\right)$

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Log properties to aid:

rewrite:

1. $f(x) = \ln\sqrt{x+1}$

$f'(x) =$

2. $f(x) = \ln\dfrac{x\left(x^2+1\right)^2}{\sqrt{2x^3-1}}$

$f'(x) =$

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Change of Base:

Derivative of $y = \log_b x$

$$\frac{d}{dx}\left(\log_b x\right) = \frac{d}{dx}\left(\frac{\ln x}{\ln a}\right)$$

general:

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Find $\frac{dy}{dx}$

1. $y = \log_2\left(\sin\left(x\right)\right)$

2. $y = x^3 \log_5\left(2x+1\right)$

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Logarithmic differentiation:

$y = x^x$

1. write equation
2. take natural log of each side
3. use log properties to rewrite
4. use implicit differentiation
5. simplify and solve for $\frac{dy}{dx}$
6. substitute for y
7. simplify

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$$y = \frac{\sqrt{2x+1}\left(x+3\right)^5}{\left(x-7\right)^2}$$

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