

## Differentiating Log or Exponential Functions

p. 240 - 245 (3.7)

# 35

1. Exponential functions

$$\frac{d}{dx} a^x = \ln a (a^x)$$

or 
$$\frac{d}{dx} a^u = \ln a (a^u) \left( \frac{du}{dx} \right)$$

2. Log functions

$$\frac{d}{dx} (\log_a x) = \frac{1}{(\ln a)x}$$

or 
$$\frac{d}{dx} \log_a u = \frac{1}{(\ln a)} \frac{1}{u} \frac{du}{dx}$$

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Find  $y'$ .

1.  $2^{3x} = y$

$$y' = (2^{3x}) (\ln 2) (3)$$

2.  $y = \log_{10} \cos(x)$

$$y' = \frac{-\sin x}{\cos x \ln 10} = \frac{-\tan x}{\ln(10)}$$

3.  $y = 5^{(x^3 + 5x)}$

$$y' = 5^{(x^3 + 5x)} \cdot \ln 5 \cdot (3x^2 + 5)$$

4.  $y = \log_6 \frac{1}{\sqrt{x}} = \log_6 1 - \frac{1}{2} \log_6 x$

$$= -\frac{1}{2} \log_6 x$$

$$y' = -\frac{1}{2} \left( \frac{1}{x \ln 6} \right) = \frac{-1}{2x \ln 6}$$