

LOGARITHMIC DIFFERENTIATION:

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

$$(2) \frac{d}{dx} \log_a x = \frac{1}{\ln(a)x}$$

$$(3) \frac{d}{dx} [\ln(f(x))] = \frac{1}{f(x)} f'(x)$$

$$(4) \frac{d}{dx} [\log_a(f(x))] = \frac{f'(x)}{f(x)\ln(a)}$$