2.9 – Derivatives of Logarithmic Functions

1. Develop formulas for $\frac{d}{dx}\left[\ln x\right]$ and $\frac{d}{dx}\left[\log_a x\right]$.

2. Find an equation for the line tangent to $h\left(x\right)=\ln\left(10-x^2\right)$ at $x=-3$.

3. Calculate the derivative for the following functions.

a. $g(x) = \dfrac{\ln x}{x-4}$

b. $x(t) = \log_4(\sec t)$

Review of Logarithmic Properties

$$\log_a(xy) = \log_a x + \log_a y$$

$$\log_a \frac{x}{y} = \log_a x - \log_a y$$

$$\log_a x^y = y \log_a x$$

4. Differentiate.

a. $f(x) = \ln \sqrt{\dfrac{x(2x-9)}{x^2+4}}$

b. $g(x) = \log\left(\dfrac{\sqrt{x}}{x-5}\right)$

Logarithmic Differentiation

5. Find the derivative of the following functions.

a. $y = x^{\tan x}$

b. $y = (\sin x)^{x}$

6. Find the *n*th derivative of $y = \ln x$.