5.6 The Derivatives of Logarithms

These problems are taken from the Nelson Text: Pg. 575

3. Determine the derivative for each of the following:

   a. $y = \ln(5x + 8)$

   b. $y = \ln(x^2 + 1)$

   c. $s = 5 \ln t^3$

4. Differentiate each of the following:

   d. $g(z) = \ln(e^{-z} + ze^{-z})$

   e. $s = \dfrac{e^t}{\ln t}$

   f. $h(u) = e^{\sqrt{u}} \ln \sqrt{u}$

5. a. If $g(x) = e^{2x-1} \ln(2x - 1)$, evaluate $g'(1)$.

   b. If $f(t) = \ln\left(\dfrac{t - 1}{3t + 5}\right)$, evaluate $f'(5)$.

   c. Check your calculations for parts a. and b. using either a calculator or a computer.

6. For each of the following functions, solve the equation $f'(x) = 0$:

   a. $f(x) = \ln(x^2 + 1)$

   b. $f(x) = (\ln x + 2x)^{\frac{1}{3}}$

   c. $f(x) = (x^2 + 1)^{-1} \ln(x^2 + 1)$

10. Determine the equation of the tangent to the curve defined by $y = \ln(1 + e^{-x})$ at the point where $x = 0$.

(*over*)

Answers to Selected Problems

3. **a.** $\dfrac{5}{5x+8}$

b. $\dfrac{2x}{x^2+1}$

c. $\dfrac{15}{t}$

4. **d.** $\dfrac{-ze^{-z}}{e^{-z}+ze^{-z}}$

e. $\dfrac{te^t \ln t - e^t}{t(\ln t)^2}$

f. $\dfrac{1}{2}e^{\sqrt{u}}\left(\dfrac{1}{2}e^{\sqrt{u}}\ln u + \dfrac{1}{u}\right)$

5. **a.** $2e$

b. 0.1

6. **a.** $x = 0$

b. no solution

c. $x = 0, \pm\sqrt{e-1}$

10. $y = -\frac{1}{2}x + \ln 2$