Some Extras

Example 3: Find derivatives of the following functions.

(a) $f(x) = \log_{10} \sqrt{x}$

(b) $g(x) = \log_2(\cos x)$

Example 4: Differentiate f and find the domain of f'.

(a) $f(x) = \sqrt{5 + \ln x}$

(b) $f(x) = \dfrac{x}{1 - \ln(x+1)}$

Example 5: Differentiate the following functions.

(a) $y = \ln |x|$.

(b) $f(x) = \ln |\sec x + \tan x|$

It is often easier to first use the rules of logarithms to expand a logarithmic expression before taking the derivative. To do this properly you first must recognize when these rules can be applied and apply them correctly.

Rules and Non-Rules for Logarithms

- $\ln(AB) =$ _____
- $\ln(A/B) =$ _____
- $\ln(A^r) =$ _____
- $\ln(A+B) =$ _____
- $\ln(A-B) =$ _____
- $(\ln A)^r =$ _____

Example 6: Differentiate the following functions by first expanding the expressions using the rules for logarithms. Explain *why* this is the better way to proceed in each case.

(a) $f(x) = \ln\sqrt{5x+2}$

(b) $g(x) = \log_5(x^2\sqrt{x+1})$

Example 7: Differentiate $f(x) = \ln\left(\dfrac{x(x^2+1)^2}{\sqrt{2x^4-5}}\right)$