Derivatives of Inverse Functions and Logarithms (3.8)

Expected Skills.
At the end of this section, students will be able to:

- compute the derivative of the inverse of a function,
- compute the derivatives of $\ln(x)$, a^x, $\log_a(x)$,
- explain in mathematical terms why the derivative of the inverse function is the reciprocal of the derivative,

Pre-Class Activity (ch3-derivatives-6-inverse-1-pc)**.** The goal of the pre-class activity is threefold. First, present the general question/problem we want to solve. Second, make the link with prior knowledge on inverse functions. And third, have the students develop an intuition on what $(f^{-1}(x))'$ may be based on graphs (this intuition will then be confirmed with computations in class).

Worksheet (ch3-derivatives-6-inverse-2-ws)**.** This activity focuses first on proving the formula for the derivative of the inverse function and when it applies. We then have the students compute/find the formulae for $(\ln x)'$, $(a^x)'$ and $\log_a x$ (giving the last one). Finally, we focus on using these formulae to compute derivatives.

Supplemental Activity (ch3-derivatives-6-inverse-3-sup-applications)**.** This activity focuses on the core ideas of using function composition, the chain rule, and implicit differentiation to compute the derivative of the inverse of a function. Students are then asked to take these ideas and apply them to determine derivatives of inverse trigonometric functions as well as to compute the derivative of rational functions.