Math 1a. §3.7 Worksheet
Derivatives of Logarithmic Functions

Fall 2005

1. Find the derivative of each of the following functions.

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

   (b) $y = \ln(e^{2x})$

   (c) $g(u) = \log_2(\cos u - 1))$

   (d) $y = x \ln x - x$

   (e) $y = \ln\left[(x^2 + 1)\sqrt{x^3 + 2x - 3}\right]$

   (f) $y = \ln\left(\dfrac{\sqrt{x^2 + 1}}{e^x(x^3 + x - 2)^9}\right)$

   (g) $y = \dfrac{\sqrt{x^2 + 1}}{e^x(x^3 + x - 2)^9}$

2. Suppose that A and B are constants. Verify that $y(x) = Ax^{-1} + B + \ln x$ satisfies the equation

$$x^2 y'' + 2xy' = 1.$$

3. Which is larger, e^π or π^e? Consider the function $f(x) = x - e \ln x$.

   (a) Show that $f(\pi) > 0$. You can do this by showing that the minimum value of f occurs at e.

   (b) Use part (a) to show that $e^\pi > \pi^e$.