

## Homework #16 and Worksheet 10

Due Wednesday April 27th in Gradescope by 11:59 pm ET

**Goal:** Solidify Calculus for the Natural Logarithm

Differentiate each of the following:

1.  $y = x \ln x - x$

2.  $y = \sin(\ln x)$

3.  $y = \ln(\sin x)$

4.  $f(x) = \ln\left(\frac{1}{x}\right)$

5.  $f(x) = \frac{1}{\ln x}$

6.  $y = \ln(\ln(\ln x))$

7.  $y = (\ln x)^3$

8.  $y = \ln(x^3)$

9.  $y = \ln(e^{-3x})$

10.  $y = x^2 \cdot \ln(2 + e^{-6x})$

11.  $y = \ln \sqrt{x}$

12.  $y = \sqrt{\ln x}$

13. If  $f(x) = \ln(1 + e^{2x})$ , find  $f'(0)$ .

14. Find the Absolute Maximum and/or Minimum Values for  $f(x) = \frac{\ln x}{x}$

15. Find the Absolute Maximum and/or Minimum Values for  $f(x) = \frac{x}{2} - \ln x$

Simplify each of the following:

16.  $\ln e^3 + e^{-4 \ln 2}$

17.  $e^{\ln(\ln 3)} + \frac{1}{3} \ln 8$

18.  $\ln \frac{1}{\sqrt{e}} + \sqrt{e^{2 \ln 3}}$

19. Show that  $2 \ln x - 3 \ln y - 4 \ln z = \ln\left(\frac{x^2}{y^3 z^4}\right)$

Compute the following Integrals:

20.  $\int_{-e^2}^{-e} \frac{5}{x} dx$

21.  $\int_0^3 \frac{1}{5x+1} dx$

22.  $\int_e^{e^5} \frac{1}{x \ln x} dx$

23.  $\int \frac{x^6}{2-x^7} dx$

24.  $\int_0^{\ln 2} \frac{e^{3x}}{8+e^{3x}} dx$

25.  $\int_1^2 \frac{1+x^3}{x^4} dx$

# REGULAR OFFICE HOURS

**Monday: 1:00–3:00 pm**

**Tuesday: 12:00–4:00 pm**

7:30–9:00 pm TA Bobby, SMUDD 205

**Wednesday: 1:00–3:00 pm**

**Thursday: none for Professor**

7:30–9:00 pm TA Bobby, SMUDD 205

**Friday: 12:00–2:00 pm**

- Train 1 hour a day