

Worksheet 10, Tuesday, April 15th, 2025

Derivatives Compute each of the following derivatives.

1. y' where $y = \ln\left(\frac{1}{x}\right) + \frac{1}{\ln x}$ Think about the *Prep* for each piece.
2. $f'(x)$ where $f(x) = (\ln x)^3 + \ln(x^3)$
3. $f'(x)$ where $f(x) = \frac{1}{\sqrt{\ln x}} + \frac{1}{\ln \sqrt{x}} + \frac{1}{e^{\sqrt{x}}} + \frac{1}{e^x + \ln x}$ Do not simplify. *Prep(s)*?
4. Let $y = (\tan x)^x$. Compute $\frac{dy}{dx}$
5. y' where $y = \ln\left(\frac{\sqrt{1-x} \cdot e^{\sec x}}{(\sin x)^{\frac{6}{7}} \cdot \ln x}\right)$ Do not simplify the final answer.
6. Compute the Maximum/Minimum Values for $f(x) = \frac{\ln x}{x}$ keeping $x > 0$.
7. **Prove** the formula $\boxed{\frac{d}{dx} \ln x = \frac{1}{x}}$

Integration Compute each of the following integrals:

8. $\int \frac{e^{4x}}{(1 + e^{4x})^2} dx$
9. $\int \frac{(1 + e^{4x})^2}{e^{4x}} dx$
10. $\int_{e^3}^{e^8} \frac{8}{x\sqrt{1 + \ln x}} dx$
11. $\int_0^{\frac{\pi}{6}} \tan x dx$
12. $\int_0^{\ln 2} \frac{e^{3x}}{8 + e^{3x}} dx$
13. $\int \frac{x^6}{2 - x^7} dx$
14. $\int \frac{2 - x^6}{x^7} dx$
15. Find the equation of the tangent line to

$$y = \ln(1 + \cos x) - e \cos(\ln(1 + x)) + e^{1 + \ln(1 + x)} + (\sin x)e^{\cos x}$$

at the point where the x -coordinate is 0.

Turn in your own solutions into Gradescope before 11:59 pm today, Tuesday April 15

Finish all problems through number 14