Math 106, Spring 2026

Worksheet 9, Tuesday, April 7th, 2026

Differentiation

1. Find the Local Maximum and/or Local Minimum **Value(s)** for $f(x) = \dfrac{x}{e^{3x}}$.

2. Compute $f'(x)$ where $f(x) = \sqrt{\cos(x^2 + e^x)} + \cos\sqrt{x^2 + e^x} + e^{\sqrt{x^2+\cos x}}$. Do Not Simplify.

3. Differentiate $f(x) = \dfrac{1 + e^{-2x}}{1 - e^{7x}}$. Simplify the numerator in the Quotient Rule.

Integration Compute each of the following integrals.

4. $\displaystyle\int e^x \left(1 + e^x\right)^2 \, dx$

5. $\displaystyle\int \frac{(1 + e^x)^2}{e^x} \, dx$

6. $\displaystyle\int (e^x + e^{-x})(e^x - e^{-x}) \, dx$ 2 ways?

7. $\displaystyle\int (e^{4x} + e^{-9x})^2 \, dx$

8. $\displaystyle\int \frac{\sqrt{1 + e^{-3x}}}{e^{3x}} \, dx$

9. $\displaystyle\int \frac{e^{\frac{1}{x}}}{x^2} \, dx$

10. $\displaystyle\int \cos x \cdot e^{5+\sin x} \, dx$

11. $\displaystyle\int e^{8x} + e^x + \frac{1}{e^x} + \frac{1}{e^{8x}} \, dx$

12. Compute the area bounded between $y = e^x$, $y = x$ and $x = -1$ to $x = 4$. Sketch and shade the described bounded region.

13. Find the function $f(x)$ that satisfies $f'(x) = \dfrac{e^{3x}}{\sqrt{8 + e^{3x}}}$ and $f(0) = -4$.

14. Find the function $f(x)$ that satisfies $f'(x) = \dfrac{x^2}{e^{(x^3)}}$ and $f(2) = \dfrac{1}{e^8}$.

15. Find the function $f(x)$ that satisfies $f'(x) = \dfrac{e^{\sqrt{\tan x}} \sec^2 x}{\sqrt{\tan x}}$ and $f\left(\dfrac{\pi}{4}\right) = 1$.

Turn in your own solutions into Gradescope before 11:59 pm today, Tuesday April 7

Finish all problems through number 13