Math 106, Spring 2025

Worksheet 6, Tuesday, March 11th, 2025

Compute each of the following Indefinite Integrals using u-substitution: Remember $+C$ each time.

1. $\int x^7 \left(4 - x^8\right)^6 \, dx$ 2. $\int \frac{\cos \sqrt{x}}{\sqrt{x}} \, dx$ 3. $\int (\cos x) \, \sin^6 x \, dx$ 4. $\int x^5 \sqrt{x^6 + 7} \, dx$

5. $\int \frac{x}{(x^2+1)^9} \, dx$ 6. $\int \frac{\sin x}{\cos^5 x} \, dx$ 7. $\int \sec^2 x \cdot \tan^5 x \, dx$ 8. $\int \frac{\left(9 + \frac{1}{x}\right)^3}{x^2} \, dx$

9. $\int_1^4 \frac{1}{\sqrt{x}\,(1+\sqrt{x})^3} \, dx$ Note: Definite Integral for u-substitution. **Change your limits.**

10. Find a function $f(x)$ that satisfies $f'(x) = x^2 \sin(x^3)$ and $f(0) = 3$

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11. Consider an object travelling with velocity given by $v(t) = t - 4$ feet per second.

(a) Graph $v(t)$.

(b) Graph $|v(t)|$.

(c) Write out the definition of $|v(t)| = |t - 4|$.

(d) Compute the **Displacement** for this object from time $t = 1$ to $t = 5$.

(e) Compute the **Total Distance** for this object from time $t = 1$ to $t = 5$.

For (d) and (e), think about the Area Interpretations to see if those values make sense...

Use the Fundamental Theorem of Calculus Part I for the following:

12. Compute $f'(x)$ where $f(x) = \int_5^x \frac{1}{t+7} \, dt$.

13. Compute $f'(x)$ where $f(x) = \int_x^9 \sqrt{t^2+3} \, dt$.

14. Compute $g''(x)$ where $g(x) = \int_x^7 \sqrt{1+\cos t} \, dt$.

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

Finish all problems through number 10