Math 106, Spring 2023

Homework #13

Due **Friday, March 24th** in Gradescope by 11:59 pm ET

Goal: Computing Definite Integrals using the FTC and also u-substitution.

1. Compute $\int_{-1}^{2} 2 - 3x - x^2 \, dx$ using Two different methods.

(a) Fundamental Theorom of Calculus

(b) Limit Definition of the Definite Integral.

Compute the following Indefinite Integrals. Simplify.

2. $\int x^2 \left(1 - x^3\right)^7 \, dx$

3. $\int \frac{x^4}{\left(x^5 - 3\right)^8} \, dx$

4. $\int \sec(3x) \tan(3x) \, dx$

5. $\int x^2 \cos\left(x^3 - 6\right) \, dx$

6. $\int \frac{\sec^2\left(\frac{1}{x}\right)}{x^2} \, dx$

7. $\int \cos^4 x \cdot \sin x \, dx$

8. $\int x\sqrt{4 - x^2} \, dx$

9. $\int \frac{x}{\sqrt{4 - x^2}} \, dx$

10. $\int \frac{\sin\sqrt{x}}{\sqrt{x}} \, dx$

11. $\int \frac{\cos x}{\sin^2 x} \, dx$

12. $\int \sqrt{x} \cdot \cos\left(9 + x^{\frac{3}{2}}\right) \, dx$

13. $\int \frac{\cos x + \sin x}{(\cos x - \sin x)^3} \, dx$

Compute the following Definite Integrals. Simplify. Remember to *mark OR change your limits*

14. $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \cos(4x) \, dx$

15. $\int_{2\pi}^{6\pi} \sin\left(\frac{x}{6}\right) \, dx$

16. $\int_{\frac{\pi}{4}}^{\frac{\pi}{3}} \frac{\sec^2 x}{\tan^3 x} \, dx$

17. If $w'(t)$ is the rate of growth of a child in pounds per year, what does $\int_5^{10} w'(t) \, dt$ represent?

18. Consider velocity for a particle moving on a line given by $v(t) = 3t - 6$ meters per second.

- Compute both (a) the Displacement and (b) the Total Distance traveled by the particle when $0 \leq t \leq 3$.
- Sketch both $v(t)$ and $|v(t)|$.

The second sketch $|v(t)|$ will help you figure out the Absolute Value cases for the Total Distance formula.

REGULAR OFFICE HOURS

Monday: 12:00–3:00 pm

Tuesday: 1:00–4:00 pm

7:30–9:00 pm TA Ellerman, SMUDD 204

Wednesday: 1:00-3:00 pm

Thursday: none for Professor

7:30–9:000 pm TA Ellerman, SMUDD 207

Friday: 12:00–2:00 pm

- Check that you substitute all pieces. Check constants carefully.
- Definite Integral is a value. Indefinite Integral is a collection of functions.
- Grab an extra hour a day to study.