Lesson 33: Section 5.4, 5.5 Part 1

Working with Integrals

- If a function is even or odd, we can use symmetry to make it easier to compute some integrals
  - If f is even
    $$\int_{-a}^{a} f(x)\,dx = 2\int_{0}^{a} f(x)\,dx$$
  - If f is odd
    $$\int_{-a}^{a} f(x)\,dx = 0$$
- The average value of a function $f(x)$ on $[a,b]$ is
  $$\frac{1}{b-a}\int_{a}^{b} f(x)\,dx$$

Substitution Rule

- Substitution "undoes" chain rule:
  $$\int f'(g(x)) \cdot g'(x)\,dx = \int f'(u)\,du$$
  $u = g(x)$
  $du = g'(x)\,dx$
- Tips for choosing u:
  - The derivative of u should be a constant multiple of a factor of the integrand
  - u is often the more complicated part of the integrand
  - If there is a composition of functions in the integrand, try setting u equal to the inside function.

Computing Indefinite Integrals

1. Choose u and find du
2. Substitute u and du into the integral; get rid of all x
3. Evaluate the integral
4. Substitute x back into the solution

Computing Definite Integrals

1. Choose u and find du
2. Substitute u and du into the integral; get rid of all x
3. Adjust the integration limits to $u=$
4. Evaluate the integral

Practice Problems

1. For each part choose and evaluate one of the given integrals.

(a) $\int_1^2 x^2 e^{x^3}\, dx$ OR $\int_1^2 e^{x^3}\, dx$

(b) $\int \sin(5x)\, dx$ OR $\int x \cdot \sin(5x)\, dx$

(c) $\int \sec^2(3x^2)\, dx$ OR $\int x \sec^2(3x^2)\, dx$

2. Create a composition of two functions and take the derivative. Do not simplify your derivative. Have your group members find the antiderivative of your answer.