

3B - Integral Calculus
Week 2

Fundamental Theorem of Calculus

- Fundamental Theorem of Calculus Part 1: If $g(x) = \int_a^x f(t) dt$ then _____

- BE CAREFUL: If $h(x) = \int_1^{\sin(x)} 4x dx$ then $h'(x) =$ _____

- Fundamental Theorem of Calculus Part 2: If F is an antiderivative of f , then

$$\int_a^b f(x) dx = \underline{\hspace{2cm}}$$

- What's the difference between definite and indefinite integrals? _____

- You Try!

(1) $\int_0^2 x(2 + x^2) dx$

(2) Find $h'(x)$ if $h(x) = \int_0^{x^2} \sqrt{1 + r^3} dr$

(3) $\int \sqrt[3]{x} dx$

 U -Substitutions:

- Strategy: (1) Choose u to be _____
(2) Find du and substitute. You might need to _____
(3) Evaluate the integral. Then _____

- Example: $\int \sec^2(10x) \tan^7(10x) dx$

- You Try!

(1) $\int \frac{x}{x^2 + 1} dx$

(2) $\int \tan(x) dx$

Definite Integrals W/ U-Substitutions:

- Strategy: (1) Choose u . (2) Find du and substitute. (3) Change the bounds. (_____) (4) Evaluate the definite integral.

- Example: $\int_{-\pi/40}^{\pi/40} \sec^2(10x) \tan^7(10x) dx$

- You Try!

$$(1) \int_0^{\pi} \sec^2(t/4) dt$$

$$(2) \int_0^2 (x-1)^{25} dx$$

Integrals of Piecewise Functions and the Absolute Value Function:

- Absolute value: $|x| = \begin{cases} -x & x < 0 \\ x & x \geq 0 \end{cases}$ so $\int_{-5}^5 |x| dx =$ _____

- Piecewise Functions (example): If $f(x) = \begin{cases} -x+3 & x \leq -1 \\ x^2+3 & x > -1 \end{cases}$ then

$$\int_{-2}^2 f(x) dx =$$

- You Try! $\int_{-3}^4 |x^2 - 4| dx$