MATH 3B

Discussion Worksheet - Thursday, April 12

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

$$\int_a^b f(x)\,dx = \underline{\hspace{3cm}}$$

- What's the difference between definite and indefinite integrals? ____________________
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- 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) Substitute. You might need to ______________________________________
(3) Evaluate the integral.
- 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:

- Example: $\displaystyle\int_{-\pi/4}^{\pi/4} \sec^2(10x)\tan^7(10x)\,dx$

- You Try!

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

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

Integrals of Piecewise Functions and the Absolute Value Function:

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

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

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

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