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We Make Math Easy.

Chapter 5.3

Tutorial Length
20 Mins

Homework ~ Tutorials ~ Past Tests

Important

Math 1013 is a HUGE course. Many students fear the course, but you don't need to, you've got us! The keys to success are to practice as many types of problems as possible and not to fall behind. Each chapter builds on the concepts of a previous chapter so it's crucial to understand the material from one chapter before moving on.

This is where MATH1013.COM comes in. We have developed extensive tutorial videos for each section that will give you a quick overview of the theory before we jump in to examples. Our goal is to make things as simple as possible. We will go through MANY examples in order to ensure you understand the concept. We want to show that one concept can be tested in multiple different ways. By making your way through all the questions, you will see different variations and learn new techniques that will make MATH 1013 a breeze. We'll show you shortcuts, easy tricks to remember, and even go through past test questions.

In short, if you're reading this, you're already on the right path. Your success is our success and we wish you the best with this course.

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Helpful Tips

- Each question has a 4 digit video ID code. If you only want to watch a specific example, just search for the 4 digit code in the playlists.
- Some sections are very long. Consider breaking it down into smaller periods of time (1 hour chunks) in order to efficiently absorb the information.
- When going through tutorial videos, if you are having a particularly difficult time with a question, skip it and come back later. Sometimes the brain just needs a bit of a break!
- Keep all of your MATH1013.com booklets in a binder. This way when it's time to do a final review for a test, you can quickly go through the material. Try to circle or highlight key points. These items will stand out when you begin reviewing.
- If you've purchased access to past tests, don't go through those questions until you feel you've learned all the material. Then go through as many past tests as possible in preparation for your actual test. Once you go through the solutions, you will see where you still have issues and what you still need to review.

Policy Reminder:

While sharing is caring, any user accounts found to be shared between students will be terminated with no refunds. Additionally, access to all premium content will expire after the final exam. Please see the account terms and conditions for more details.

Contact

Questions, Concerns, Comments? info@math1013.com
Please note we are unable to offer tutoring assistance over e-mail.

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Fundamental Theorem of Calculus [VID_1736]

If $f(x)$ is continuous on $[a, b]$, then:

Part 1:
$F(x) = \int_a^x f(t)dt$, then $F'(x) = f(x)$

Part 2:
$$\int_a^b f(x)dx = F(x) \Big|_a^b = F(b) - F(a)$$

Part 1 tells us integration and differentiation are inverse processes. Furthermore, integration is the same thing as finding an antiderivative.

Part 2 tells us that in order to evaluate a definite integral, find the antiderivative, plug in the integral boundaries, and find the difference.

Types of Integrals

$\int_a^b f(x)dx$ Definite Integral (boundaries)

$\int f(x)dx$ Indefinite Integral (no boundaries)

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Integral/Antiderivative Formula Sheet

PDF ID: 2-05-03-000-00-0

1	$\int kf(x)dx = kF(x) + C$	Constant Multiple Rule
2	$\int \big(f(x) \pm g(x)\big)dx = F(x) \pm G(x) + C$	Sum/Difference Rule
3	$\int kdx = kx + C$	Constant Rule
4	$\int x^n dx = \frac{x^{n+1}}{n+1} + C \; x \neq -1$	Power Rule
5	$\int \frac{1}{x}dx = \int x^{-1}dx = \ln\lvert x\rvert + C$	Exception to Power Rule
6	$\int \frac{1}{bx \pm k}dx = \frac{1}{b}\ln\lvert bx \pm k\rvert + C$	
7	$\int e^{kx}dx = \frac{1}{k}\mathrm{e}^{\mathrm{kx}} + C$	Exponential Rule For Base e
8	$\int a^{kx}dx = \frac{1}{k}\frac{\mathrm{a}^{\mathrm{kx}}}{lna} + C \; a > 0, a \neq 1$	Exponential Rule For Other Bases
9	$\int \sin(kx)\,dx = -\frac{1}{k}\cos(kx) + C$	
10	$\int \cos(kx)\,dx = \frac{1}{k}\sin(kx) + C$	
11	$\int \tan(kx)dx = \frac{1}{k}\ln\lvert\sec(\mathrm{kx})\rvert + C$	
12	$\int \sec^2(kx)\,dx = \frac{1}{k}\tan(kx) + C$	
13	$\int \csc(kx)\cot(kx)dx = -\frac{1}{k}\csc(kx) + C$	
14	$\int \sec(kx)\tan(kx)dx = \frac{1}{k}\sec(kx) + C$	
15	$\int \csc^2(kx)\,dx = -\frac{1}{k}\cot(kx) + C$	
16	$\int \frac{1}{\sqrt{a^2 - x^2}}dx = \sin^{-1}(\frac{x}{a}) + C$	
17	$\int \frac{1}{a^2 + x^2}dx = \frac{1}{a}tan^{-1}(\frac{x}{a}) + C$	

Fundamental Theorem of Calculus

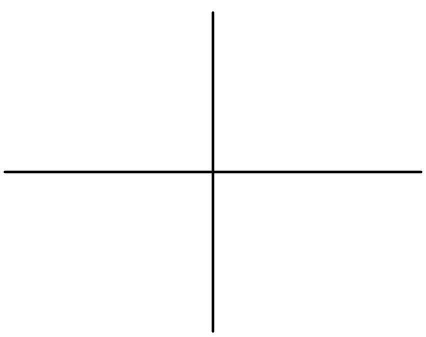
$$\int_a^b f(x)dx = F(x)\Big|_a^b = F(b) - F(a)$$

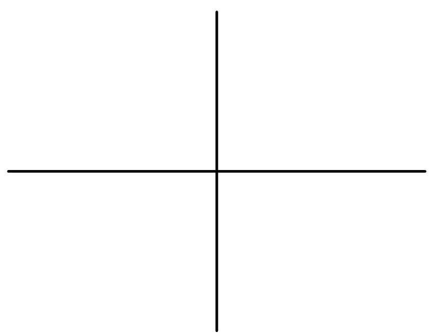
The Fundamental Theorem of Calculus tells us that a definite integral can be evaluated by finding the antiderivative and then evaluating your antiderivative at the boundaries and subtracting.

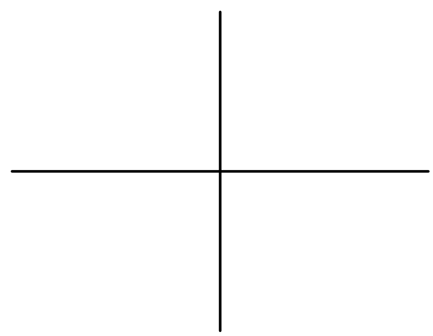
In general, the constant C is not required when we are dealing with definite integrals. This is because they will cancel out due to the subtraction that happens in the formula.

If $f(x) \geq 0$ from $[a, b]$, we find the area under the curve and above the x-axis.

If $f(x)$ varies between being positive and negative, then the definite integral tells us the **net** area under the curve. This means it's possible to get a negative number as an answer, a 0, or a positie number.







Example (VID_7930)

$$\int_{-1}^{5} 3dx$$

Example (VID_6825)

$$\int_{0}^{4} 2xdx$$

Example (VID_4268)

$$\int_{1}^{3} (x+3)dx$$

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Example (VID_0416)

$$\int_0^{\ln 4} e^{3x}\,dx$$

Example (VID_9233)

$$\int_{-1}^{1} (3t^3 - t)dt$$

Example (VID_1693)

$$\int_2^4 (u-1)^2 du$$

Example [VID_4104]

$$\int_0^{\pi} sin(2x)dx$$

Example [VID_3359]

$$\int_{-1}^{1} \cos(\pi x)dx$$

Example [VID_2427]

$$\int_4^{10} \left(\sin^2 x + \cos^2 x\right)dx$$

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