Week 11
MTH-1321 – Calculus 1

Hello and Welcome to the weekly resources for MTH-1321 – Calculus 1!

This week is Week 11 of class, and typically in this week of the semester your professors are covering these topics below. If you do not see the topics your particular section of class is learning this week, please take a look at other weekly resources listed on our website for additional topics throughout of the semester.

We also invite you to **look at the group tutoring chart on our website to see if this course has a group tutoring session offered this semester**.

If you have any questions about these study guides, group tutoring sessions, private 30 minute tutoring appointments, the Baylor Tutoring YouTube channel or any tutoring services we offer, please visit our website www.baylor.edu/tutoring or call our drop in center during open business hours. M-Th 9am-8pm on class days 254-710-4135.

KEYWORDS: *Understanding Antiderivatives, Antiderivative Process, Fundamental Theorem of Calculus 1*

Topic of the Week: Antiderivatives

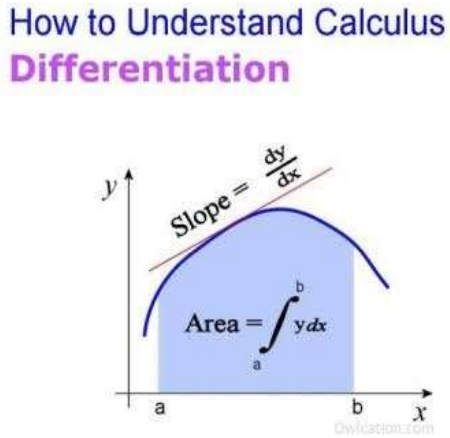
This topic of the week is a little recap of previous highlights. Antiderivatives are what many of your classes are shifting into after your last test. The concept of an antiderivative is parallel to a derivative we have been doing the last few units.

Let's think about it in stair steps. When taking the **derivative,** we are stepping down a level – getting to the small details of the function. It breaks it "down" to find the slope of the curve of any function.

Inversely, the **antiderivative** is stepping up a level. We are building the function up, a step above the original function.

If we use the concept of stairs, when we take the antiderivative, we go up a step. Now that we are one step above the original function. What would happen if we went down a step by taking the derivative? We would end up right where we started.

In math terms. f(x) is our notation for our original function. f'(x) is our derivative notation. F(x) is our antiderivative notation (capital F). So, we are going from f(x) → F(x) by taking the antiderivative. And then from F(x) → F'(x) = f(x) our antiderivative to our original function by taking the derivative of it.



Highlight #1: Anti-Derivative Process

The process of taking an antiderivative is very similar to the power rule with derivatives.

Our power rule for **derivatives** is as follows:

Notice how it is first multiplied by the power (n) and then the power is reduced by 1 (n-1).

$$\frac{d}{dx}[x^n] = nx^{n-1}$$

With **antiderivatives** it is the opposite process. FIRST, you must add 1 to the power (n+1) and THEN divide by the new power (n+1)!!

$$\int x^n dx = \frac{x^{n+1}}{n+1} + C$$

Make sure when you take the antiderivative (especially in an indefinite integral), you add +C to the end.

Ex. 1) 1) $\int 4x^3$ 2) $\frac{4x^4}{4}$ 3) x^4

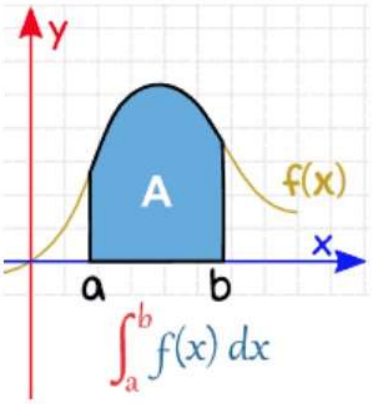
Here is a Baylor Youtube Video Going over antiderivatives!

https://www.youtube.com/watchv=pv1MthFqngM

The application of antiderivatives is pretty cool!

With derivatives, we were able to find the slope on a curve at any point. Now, with an antiderivative, we can find the **AREA under the curve** in-between 2 points.

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



$$\int_2^4 (4x^2 + 7x - 2)dx$$

Aind the antiderivative.

$$= \frac{4x^3}{3} + \frac{7x^2}{2} - 2x + c$$

Use the fundamental theorem of calculus and do F(b)-F(a).

$$\left(\frac{4(4)^3}{3} + \frac{7(4)^2}{2} - 2(4)\right) - \left(\frac{4(2)^3}{3} + \frac{7(2)^2}{2} - 2(2)\right)$$

$$= \frac{338}{3}$$

Here is a Baylor Youtube video that explains integrals!

https://www.youtube.com/watchv=IYK9angFEbg

Highlight #1: FTC 1

CHECK YOUR LEARNING

1) Find the antiderivative of $f(x) = 3x^2$ more commonly shown as $\int 3x^2 dx =$

2) Find the antiderivative of $f(x) = 36x^{17} + 2$ also shown as $\int 36x^{17} + 2\, dx =$

3) Find the antidetective of $\int dx =$

(Answers below at the end of the document.)

Things you might struggle with

Antiderivatives: Antiderivatives are the opposite of derivatives so to check your work, take the derivative of the problem. Another c**ommon mistake is to forget to add +C** so do not forget!

Thanks for checking out these weekly resources!
Don't forget to check out our website for group tutoring times, video tutorials and lots of other resources: www.baylor.edu/tutoring ! Answers to check your learning questions are below!

ANSWERS to check your learning section

1. Answer: $F(x) = x^3 + C$
2. Answer: $F(x) = 2x^{18} + 2x + C$
   - In this problem, the constant of (+2) is also integrated (different from differentiation). This means $2(x^0)$ becomes $2(\frac{x^1}{1})$, therefore making it 2x.
3. Answer: $F(x) = x^1 + C$ or just x +C
   - This one is similar in how there is a unwritten 1 for our function that we are integrating (look back at the question). The integral of 1 → $\frac{1(x^{0+1})}{1}$ which = x