Accomack County Public Schools

High School Math
Learning Plans

These plans are also available on our website:

www.accomack.k12.va.us

Please note: The online portion of these plans is optional.

High School Learning Plans

Calculus

Activities to Support Instruction During Extended School Closures

The purpose of this document is to provide an overview of suggested activities available to ACPS students. These suggestions can be used by families to support the continuity of education. The learning experiences developed and provided will give students opportunities to go deeper into concepts, ideas, and skills independently. These activities do not require copies or additional supplies.

Skills:

- I can find derivatives using various derivative formulas.
- I can find higher order derivatives.
- I can use proper notation for higher derivatives.
- I can find patterns when possible from higher derivatives.

Online:

Warmup:

- Find all the higher order derivatives for the function
  $g(t) = 21t^2 - 8t + 6$
- How many higher derivatives did you find?
- Could you have determined this before executing the problem?

Focused Instruction:

- Why do we study Calculus? Video retrieved from Khan Academy
- Strategies for deciding which derivative rule(s) to use Video retrieved from Khan Academy
- What are higher derivatives Retrieved from Math Warehouse
- Calculate higher order derivatives Video retrieved from Khan Academy

Activities:

- Quizlet flashcards on derivative rules Retrieved from Quizlet
- Quizlet interactive flashcards on Polynomial Higher Order Derivatives Retrieved from Quizlet
- Matching Derivative Rules Game Retrieved from Quizlet
- Gravity game on higher order derivatives Retrieved from Quizlet

Reflection:

If the first derivative finds the slope of the tangent line or the slope/rate of change of the graph at a point, what could the second derivative help us find?

Assessment:

- Create 6 problems that involve finding higher order derivatives. You must include at least 6 different basic derivative rules (i.e. trig, lnx, product, quotient, chain, etc.). You must include the key as well. Snap a picture with your phone and email to your teacher (or post on google classroom if that is setup).

Offline:

Warmup:

- Find all the higher order derivatives for the function
  $g(t) = 21t^2 - 8t + 6$
- How many higher derivatives did you find?
- Could you have determined this before executing the problem?

Focused Instruction:

- Definition: The second derivative, often notated as f''x or y'', is found by finding the derivative of the derivative function (also called the first derivative). The third derivative or f'''(x) or y''' is the derivative of the second derivative, or the derivative of the derivative of the derivative. Other notations are given below.

Notation for these **Higher Order Derivates** is shown below:

Original Function	1st Derivative	2nd Derivative	3rd Derivative	4th (& up) Derivative
$f(x)$	$f'(x)$	$f''(x)$	$f'''(x)$	$f^4(x)$
$g(t)$	$g'(t)$	$g''(t)$	$g'''(t)$	$g^4(t)$
$y = (\ldots x \ldots)$	$\frac{dy}{dx}$	$\frac{d^2y}{dx^2}$	$\frac{d^3y}{dx^3}$	$\frac{d^4y}{dx^4}$

Activity:

- For the following function find the higher order derivative indicated.
  - f(x)= e^x cos x

Part 1: Find $f^{age}(x)$ (Find all derivatives from the original to the value of your current age. For example, if you are sixteen years old, you will find the 16th derivative.)

Part 2: Create a chain using whatever resources you have (paper, construction paper, even toilet paper, etc.) using one link for every derivative. Connect your chain if possible.

Reflection:

- Did you find a pattern? If so, explain the pattern.

Assessment:

- Create 6 problems that involve finding higher order derivatives. You must include at least 6 different derivative rules (i.e. trig, lnx, product, quotient, chain, etc.). You must include the key as well.

Supporting Materials if applicable:

- Calculus textbook if needed.

Skills:

- I can find the derivative of a function using various rules, including the limit of the difference quotient.
- I can find the slope of the tangent line and explain how the slope relates to the graph of the function.

Online

Warmup:

- Can you name the Calculus terms? Retrieved from Sporcle (Hint: if it is a new term that you haven't learned yet, google the term and learn as much as you can about it 😊)

Focused Instruction:

- Watch Derivative as a Concept Retrieved from Khan Academy
- Watch Defining the derivative of a function and using derivative notation Retrieved from Khan Academy
- Watch Connecting differentiability and continuity: determining when derivatives do and do not exist Retrieved from Khan Academy
- As needed, watch various videos on using derivative rules Retrieved from Khan Academy

Activities:

- Definition of derivative practice problems Retrieved from Math Warehouse
- Practice problems for finding the equation of the tangent line Retrieved from Math Warehouse
- Play Definition of a derivative game Retrieved from Purpose Games
- Find the derivative Retrieved from Sporcle

Assessment:

- Quiz 1 on Derivatives Retrieved from Khan Academy (optional: email your teacher your results)
- Quiz 2 on Derivatives Retrieved from Khan Academy (optional: email your teacher your results)

Reflection:

- Would the rate of change of the function that describes the graph of those infected by the coronavirus have a position rate of change or negative? What does this tell you about the derivative of the function at each day (would it be positive or negative?) Explain your reasoning.

Advanced: (Perfect for AP students or classes that are further along)

- Complete Desmos activity on Functions and their Derivatives, matching graphs of functions with their 1st and 2nd derivatives Retrieved from Desmos
- Quizlet on review topics from Calculus including derivatives and continuity Retrieved from quizlet

Offline:

Warmup:

- Define in your own words: Derivative, tangent lines, average rate of change, instantaneous rate of change

Focused Instruction:

- Review your notes on derivatives. Create flashcards for each rule and have a family member quiz you on each rule.

Activities:

- Create a booklet that summarizes each of the derivative rules. Be sure you include the rule in notation form, at least one example of a function that uses that derivative rule and explain how to find the derivative. You can create a foldable booklet, or just staple pages of paper together. Be creative!!!

Reflection:

- Would the rate of change of the function that describes the graph of those infected by the coronavirus have a positive rate of change or negative? What does this tell you about the derivative of the function at each day (would it be positive or negative?) Explain your reasoning.

Supporting Materials if applicable:

- Calculus textbook

Skills:

- I can identify common algebra errors made in Calculus and correct them.
- I can find the limit of a function graphically, algebraically, and analytically.
- I can define continuity and determine if a function is continuous.

Online:

Warmup:

- Read Algebra Errors to Avoid Retrieved from mathbootcamps.com
- Read Common Algebra and Trigonometry Mistakes in Calculus Retrieved from matcmp.ncc.edu
- Practice correcting Algebra Errors to Avoid in Calculus Retrieved from Chegg.com

Focused Instruction:

- Watch Common Algebra Errors and how to avoid them Retrieved from YouTube
- Read through Common Math Errors in Calculus Retrieved from Pauls Online Math Notes

- Watch Estimating Limits from Graphs Retrieved from Khan Academy
- Watch Topics on limits and continuity as needed, Retrieved from Khan Academy
- Read Definition of Continuity and Types of Discontinuity Retrieved from Math Warehouse

Activities:

- Complete Desmos activity on Limits and Continuity Retrieved from Desmos
- Wacky Limits—Explain why the answers are what they are Retrieved from math.colorado.edu
- Quizlet on finding limits graphically Retrieved from quizlet

Assessment:

- Finding Limits from a graph quiz Retrieved from Purpose Games

Reflection:

- Have you seen the exponential graphs on the news when they talk about the coronavirus? If not, google "exponential graph coronavirus". Do you think there is a limit on what the graph can approach as x approaches infinity? Explain your reasoning.

Offline:

Activities:

- Complete "Algebra Errors to Avoid"-correct and explain the error in each problem

Each of the following problems has made a "fatal" algebra error. Correct each of the following errors and describe the error that was made.

1. $2x-(3y+4)=2x-3y+4$
2. $5z+3(x-2)=5z+3x-2$
3. $(5x)(6x)=30x$
4. $x(yz)=(xy)(xz)$
5. $a\left(\frac{x}{y}\right)=\frac{ax}{ay}$
6. $(4x)^2=4x^2$
7. $\left(\frac{x}{y}\right)^3=\frac{x^3}{y}$
8. $\sqrt{25-x^2}=5-x$
9. $\sqrt{x+9}=\sqrt{x}+3$
10. $(a+b)^2=a^2+b^2$
11. $-3^2=9$
12. $x^2+3x-5-(4x-5)=x^2-x-10$
13. $\sqrt{7x}=7x^{\frac{1}{2}}$
14. $3(2x-5)^2=36x^2-180x+225$
15. $\sqrt{x+y}=\sqrt{x}+\sqrt{y}$
16. $x^{-\frac{3}{2}}=\frac{1}{\sqrt[3]{x}}$

- Find the derivative of the equation in #12 on the left side and evaluate the slope of the tangent line at x=4. If the slope is positive, negative or zero, describe what you think may be happening to the function at x = 4 (for example, is it

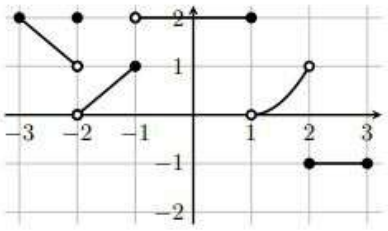
increasing at that point or decreasing or remaining constant.)

- Explain the answers for the wacky limits below. Why is the answer the answer that it is?

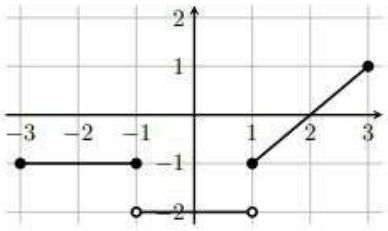
Wacky Limits **Name:** _____

These limits are wacky. Help me understand the key. All I have is the answers and not the reasons why the answers are what they are. Do this by providing the correct mathematical reasons/work explaining how one gets the correct answer.

Graph of f



Graph of g



1. $\lim_{x\to 0}(f(x)+g(x)) = 0$

2. $\lim_{x\to 2^-}\frac{g(x)}{f(x)} = \lim_{x\to 2^+}\frac{g(x)}{f(x)} = \lim_{x\to 2}\frac{g(x)}{f(x)} = 0$

3. $\lim_{x\to -1}(f(x)+g(x)) = 0$

4. $\lim_{x\to -1}\frac{f(x)}{g(x)} = -1$

5. $\lim_{x\to 2}(f(x)g(x)) = 0$

6. $\lim_{x\to 3^-} f(g(x)) = 2$

Assessment:

- Create your own limit problem using graphs and explain to a parent or sibling an example in real life of why limits don't exist if the limit from the left doesn't equal the limit from the right. Write a brief story that uses limits in some form (either limits that exist or don't exist).

Reflection:

- Have you seen the exponential graphs on the news when they talk about the coronavirus? Do you think there is a limit on what the graph can approach as x approaches infinity? Explain your reasoning.

Supporting Materials if applicable: Calculus textbook