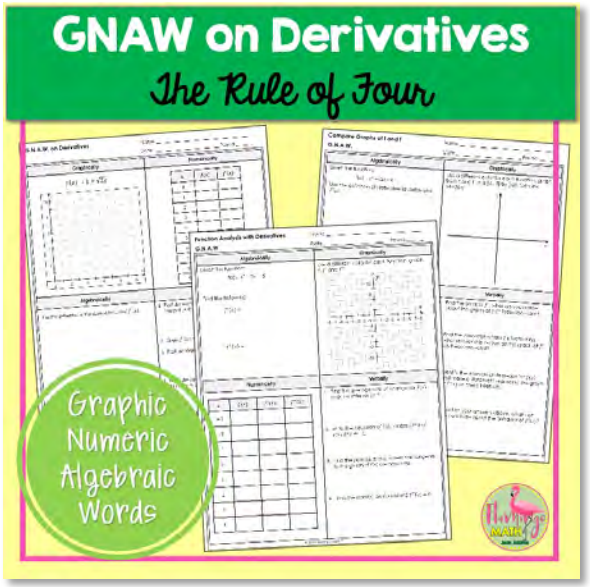


GNAW on Derivatives

Your AP Calculus students will use the Rule of Four to explore derivatives.

College Board® Topics:

Topic 2.1: Defining Average and Instantaneous Rates of Change at a Point
Topic 2.2: Defining the Derivative of a Function and Using Derivative Notation
Topic 2.3: Estimating Derivatives of a Function at a Point

What is GNAW and the Rule of Four?

The "Rule of Four" or G.N.A.W. Approach is a method of thinking about mathematics in order to make connections through multiple representations of our mathematical thinking. Students should be able to represent mathematics in graphic, numeric, algebraic, and verbal formats. G.N.A.W.

Why should you use the GNAW approach?

By implementing this process into your classes, students will gain a deeper understanding of the mathematics. The Rule of Four helps students connect and validate concepts and techniques.

How can you use the Rule of Four?

Teachers can model this approach during instructional time to set the "tone" for expected thinking and reasoning. Then, give your students many chances to practice the techniques. It is also important that students learn to make connections between the different representations.

Rule of Four Practice

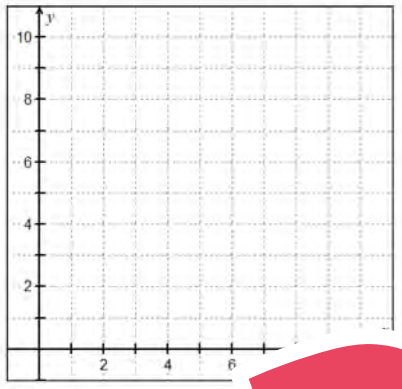
G.N.A.W. on Derivatives

Name _____

Date _____ Period _____

Graphically

$f(x) = 1 + \sqrt{2x}$



Numerically

x	$f(x)$	$f'(x)$
0		
1		
2		
3		
4		
5		

...ically

Use t... to

Verbal...

...he ... f $f(x)$ ove...
...al [...

...h $f'(x)$ on ...

...lope of ...

...rite the equation of the normal line of ...(x) at $x = 3$.

5. What does the derivative of $f(x)$ tell you about this function?

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Compare Graphs of f and f'

G.N.A.W.

Name _____

Date _____ Period _____

Algebraically

Given the function:

$f(x) = x^3 - 12x - 6$

Use the definition of d... ...rm...
$f'(x)$

Grap...

Use a different color for ...ction, graph both f and f' in a [-5, 5] ... view window.



...rically

x		
−4		
−3		
−2		
−1		
0		
1		
2		
3		
4		

Verbally

1. Find the zeros of f', what do you notice about the graph of f at these locations?
2. Find the interval(s) where f is increasing, what relationship occurs on the graph of f' on these interval(s)?
3. Identify the intervals of decrease for $f(x)$ and make a statement regarding the graph of $f'(x)$ on these intervals.
4. Based on your answers above, what can you conclude about the behavior of $f'(x)$?

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PREVIEW

Rule of Four Practice

Function Analysis with Derivatives Name _____

G.N.A.W. Date _____ Period _____

Algebraically	Graphically
Given the function: $f(x) = x^4 - 8x^2 + 5$ Find the following: $f'(x) =$	Use a different color for each function, graph f, f' and f''

Numerically

	$f''(x)$
3	
2	
1	
2	
3	
4	

the average

the interv

...e the equation of the tangent line of $f(x)$ at $x = -1$.

3. Find the point(s), if any, where the tangents to the graph of f(x) are horizontal.

4. Find the point(s) on $f(x)$ where $f''(x) = 0$

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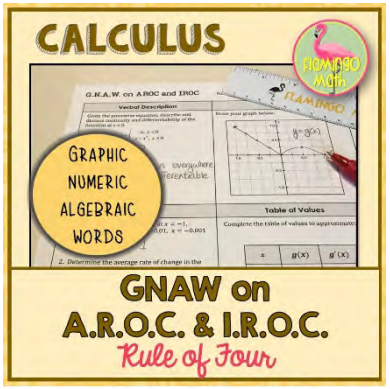
PREVIEW

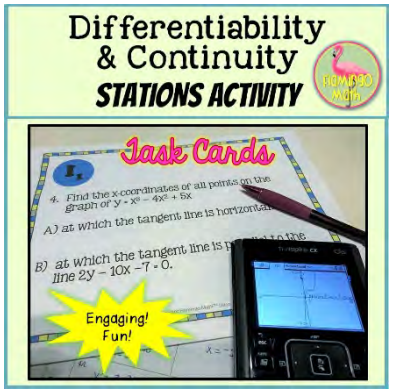


My goal is to help you bring balance into your teacher life by providing relevant content, engaging activities, and comprehensive assessments for your high-stakes math course.

Jean

More Resources for YOU







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TPT

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