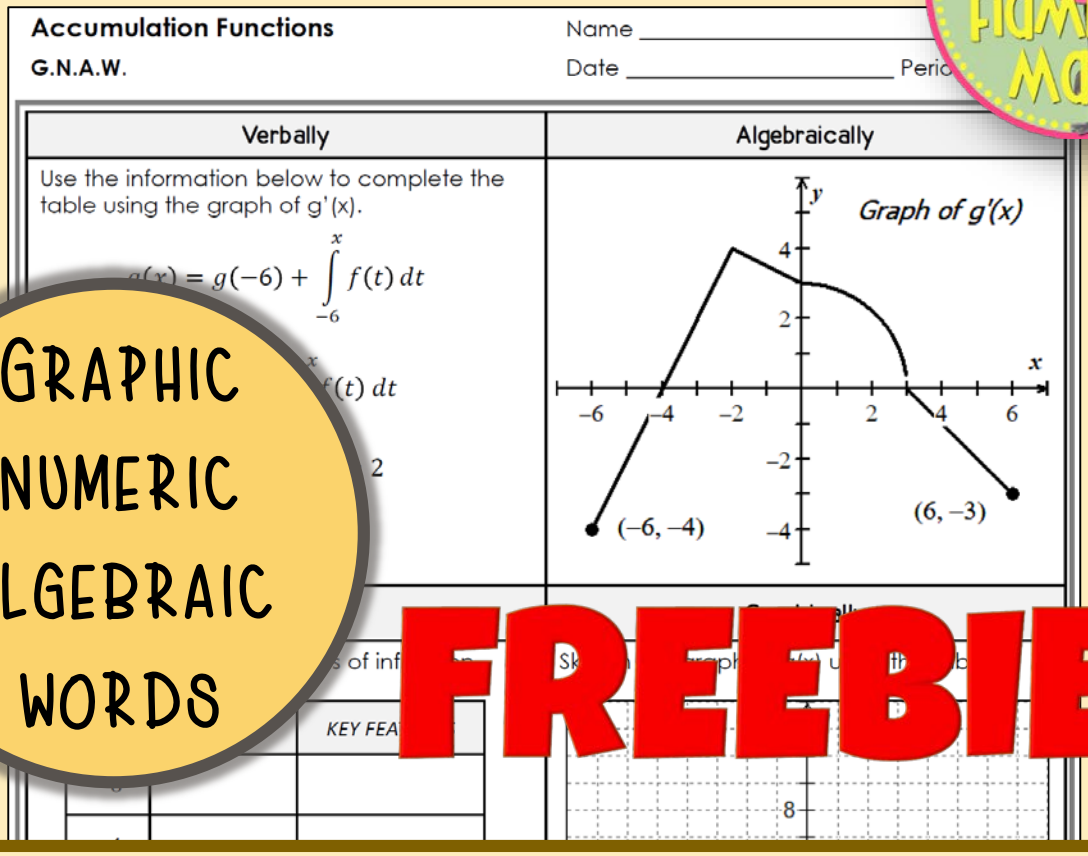
CALCULUS



GRAPHIC
NUMERIC
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GNAW on Accumulation Functions

The Rule of Four

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GNAW on Accumulation Functions

In this GNAW Activity your Calculus students will explore problems that can be represented *graphically, numerically, analytically, and verbally.* They will make connections among these representations.

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.

Accumulation Functions

G.N.A.W.

Name _____

Date _____ Period _____

Algebraically / Verbally

Let g be the function given by:

$$g(x) = g(-6) + \int_{-6}^{x} f(t)\,dt$$

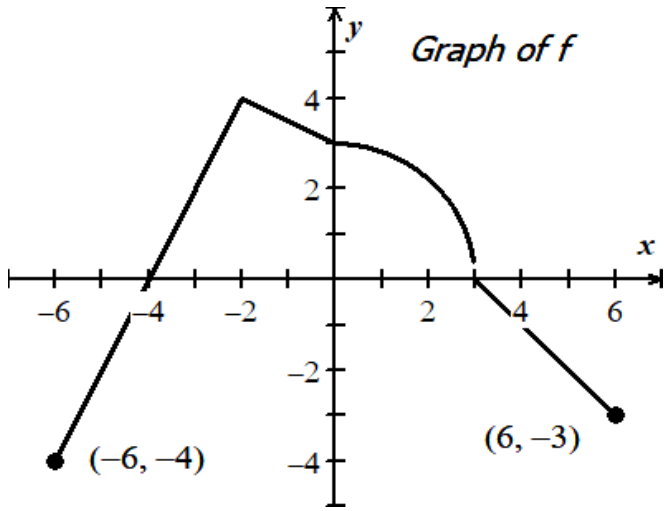
$$g(x) = 2 + \int_{0}^{x} f(t)\,dt$$

Such that $g(0) = 2$

Find the critical values of g(x):

Graphically

The graph of f consists of 3 line segments and a quarter of a circle.



Numerically / Verbally

Use the graph of f to complete the table. Label any extrema or points of inflection.

x	$g(x)$	*KEY FEATURES*
-6		
-4		
-2		
0		
3		
6		

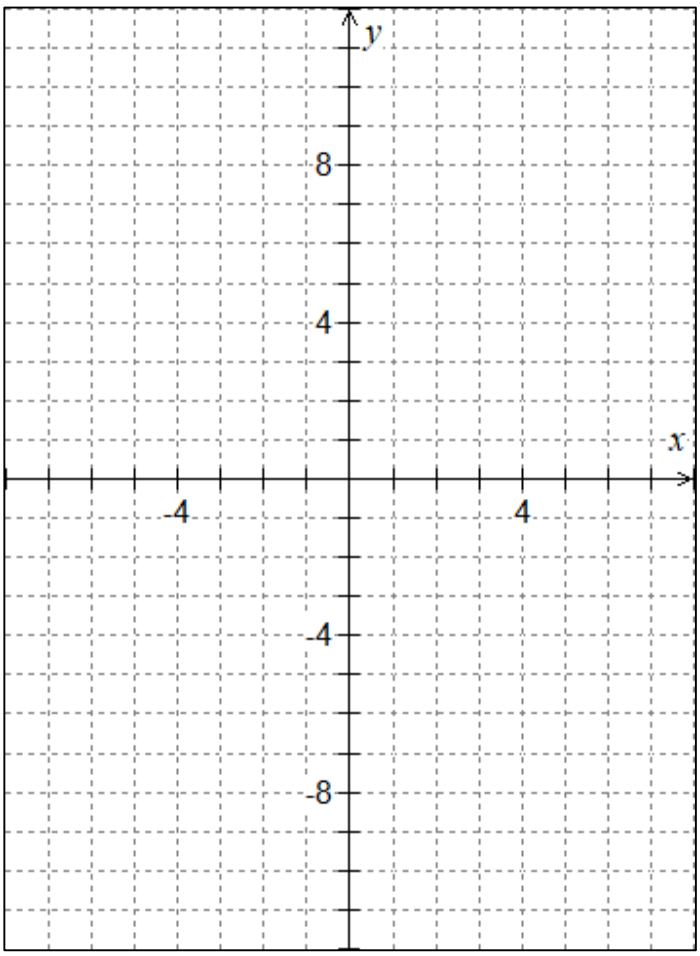
g(x) increases: _____

g(x) decreases: _____

Justify the point of inflection:

Graphically

Sketch the graph of g(x) using the table.



Accumulation Functions

G.N.A.W.

Name _____

Date _____ Period _____

Verbally

Use the information below to complete the table using the graph of g'(x).

$$g(x) = g(-6) + \int_{-6}^{x} f(t)\,dt$$

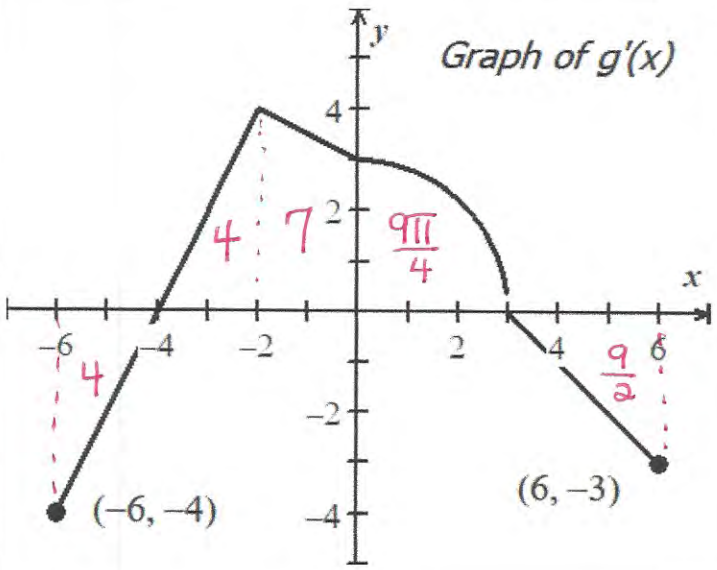
$$g(x) = 2 + \int_{0}^{x} f(t)\,dt$$

Such that $g(0) = 2$

Find the critical values of g(x):

$x = -4, x = 3$

Algebraically



Numerically

Label any extrema or points of inflection.

x	$g(x)$	KEY FEATURES
−6	−5	
−4	−9	min
−2	−5	POI
0	2	
3	$2+\frac{9\pi}{4}$	max
6	$\frac{9\pi}{4}-\frac{5}{2}$	

g(x) increases: $(-4, 3)$ $g'(x)>0$

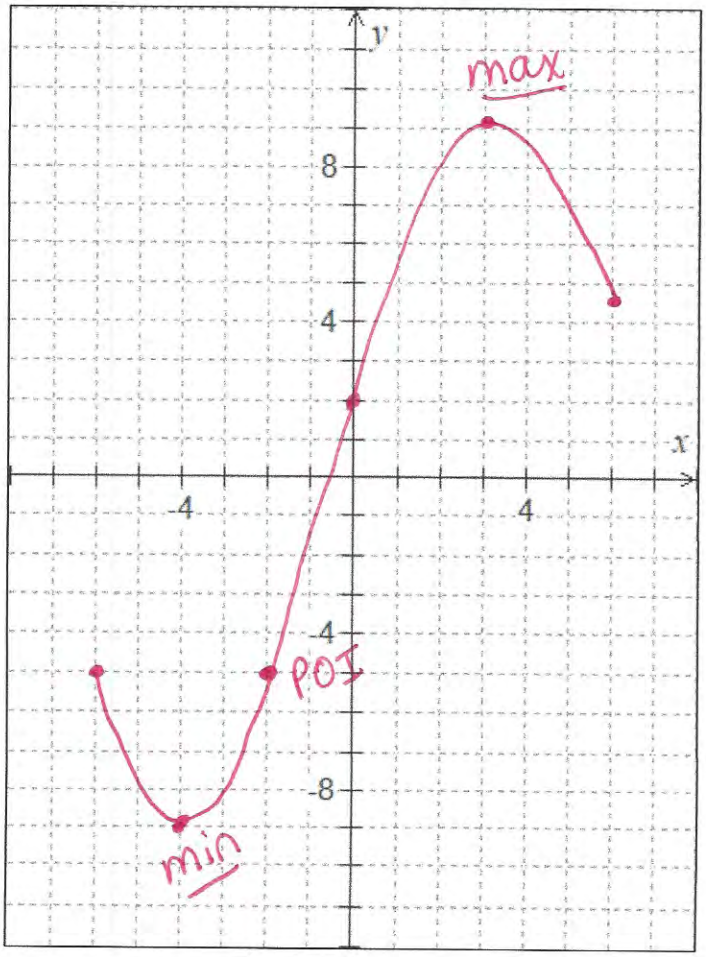
g(x) decreases: $(-6,-4)\cup(3,6)$ $g'(x)<0$

Justify the point of inflection: @ $x=-2$

g'(x) changes from increase to decrease here.

Graphically

Sketch the graph of g(x) using the table.



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