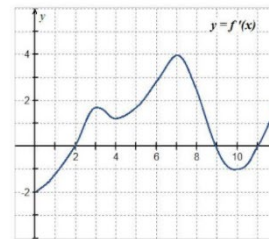


AP[®] Calculus

Explain and Justify Say What You Mean!

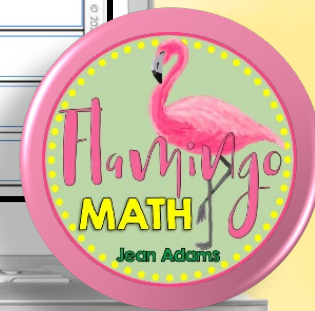


Problem Set 1: Determine the x -value(s) where $f(x)$ has a relative (local) maximum. Justify your answer.

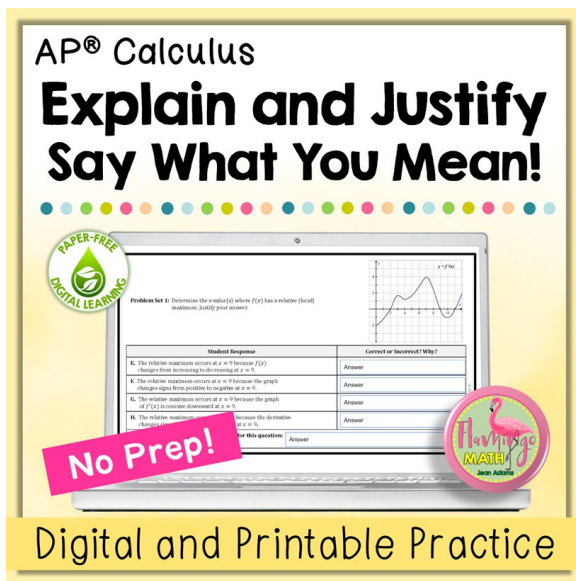


Student Response	Correct or Incorrect? Why?
E. The relative maximum occurs at $x = 9$ because $f(x)$ changes from increasing to decreasing at $x = 9$.	Answer
F. The relative maximum occurs at $x = 9$ because the graph changes signs from positive to negative at $x = 9$.	Answer
G. The relative maximum occurs at $x = 9$ because the graph of $f'(x)$ is concave downward at $x = 9$.	Answer
H. The relative maximum occurs at $x = 9$ because the derivative changes sign at $x = 9$.	Answer
For this question:	Answer

No Prep!



Digital and Printable Practice



Explain and Justification Activity Say What You Mean To Say with Google Slides™

Your AP Calculus AB & BC students will have 8 multiple choice prompts and 5 graph sets related to interpretation and justification statements which can be used as a class assignment, a distance learning activity or as a group assessment.

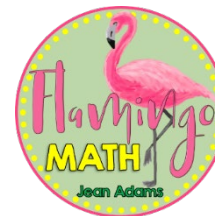
What is contained in the activity?

1. There are two separate digital formats. Part 1 contains 8 multiple choice questions on Google Forms. Students must interpret statements in context to situations presented.
2. Part 2 contains 5 problems with a graph similar to a Free Response Question with a variety of justification statements that contain errors which likely would not earn full credit on the AP Calculus Exam. There are text boxes provided to correct and explain the errors.
3. There is also a paper copy for those that need this option.

NOTE: You and your students must have a free Google account in order to access and interact with the activity.
It is not necessary to use Google Classroom to use this resource.

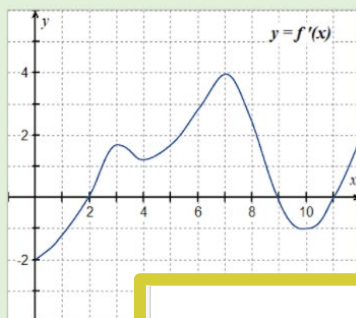
This GOOGLE SLIDES™ Activity has a copyright protected background for fonts and clipart used in the resource.
However, the GOOGLE FORMS™ section is EDITABLE and can be changed to create unlimited questions for students.





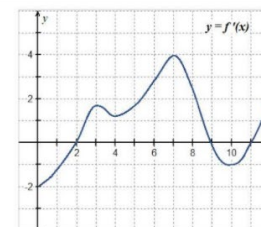
A twice-differentiable function, $f(x)$, is defined on the closed interval $[0, 12]$ and has a first derivative whose graph is shown at right. The graph of $f'(x)$ has horizontal tangent lines at $x = 3$, $x = 4$, $x = 7$, and $x = 10$.

NOTE: We will consider open intervals to define both intervals of increase/decrease and concave behaviors.



Each of the following answers to the problems presented below contain an error not earn full credit on a Free Response Question from the AP Calculus exam. Circle the part of the answer that contains the error or lack of clarity.

Problem Set 1: Determine the x -value(s) where $f(x)$ has a relative (local) maximum. Justify your answer.

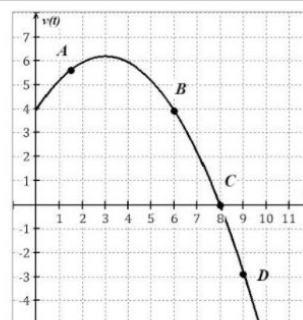


Student Response	Correct or Incorrect? Why?
E. The relative maximum occurs at $x = 9$ because $f(x)$ changes from increasing to decreasing at $x = 9$.	Answer
F. The relative maximum occurs at $x = 9$ because the graph changes signs from positive to negative at $x = 9$.	Answer
G. The relative maximum occurs at $x = 9$ because the graph of $f'(x)$ is concave downward at $x = 9$.	Answer
	Answer
	Answer

Problem Set 5: Motion Along a Curve

An object is moving along a line. The graph at right gives the object's velocity over time. For each point on the graph, determine whether the object is speeding up, slowing down, or neither.

Justify your answer for each point.



Point A: Answer

Point B: Answer

Point C: Answer

Point D: Answer

Question #1 *

1 point

1. Jennifer is driving her new car from Orlando to Atlanta. The function D gives the total distance Jennifer has driven (in miles) after t hours.
What is the best interpretation for the following statement?

The slope of the tangent line to the graph of D at $t = 4$ is equal to 62.

During the first 4 hours, Jennifer drove 62 miles per hour.

4 hours after leaving, Jennifer was 62 miles away from Atlanta.

☐ A

4 hours after leaving, Jennifer drove at a rate of 62 miles per hour.

☐ C

Question #5 *

1 point

5. Water is being pumped out of a swimming pool for repair. The function W gives the pool's water level (in feet) after t minutes.
What is the best interpretation for the following statement?

$$W'(9) = -1.25$$

After 9 minutes, the pool is draining at a rate of -1.25 feet per minute.

After 9 minutes, the pool is being drained at a rate of 1.25 feet per minute.

☐ A

☐ B

After 9 minutes the pool's water level has decreased by -1.25 feet.

☐ C

The pool is being drained at a rate of $\frac{1.25}{9}$ feet per minute.

☐ D

Say What You Mean To Say!

Name _____

1. Jennifer is driving her new car from Orlando to Atlanta. The function D gives the total distance Jennifer has driven (in miles) after t hours.

What is the best interpretation for the following statement?

The slope of the tangent line to the graph of D at $t = 4$ is equal to 62.

- A. During the first 4 hours, Jennifer drove 62 miles per hour.
 B. 4 hours after leaving, Jennifer was 62 miles away from Atlanta.
 C. 4 hours after leaving, Jennifer drove at a rate of 62 miles per hour.
 D. At time 4, Jennifer drove at a rate of 62 miles.

2. The population P of Newtonia t years after the town was founded.

What is the best interpretation for the following statement?

The slope of the line tangent to the population graph P at $t = 3$ is equal to 14.

- A. Over the first 3 years, the population increased by 14.
 B. After 3 years, the population was 14.
 C. After 3 years, the population was increasing at a rate of 14 per year.
 D. After 3 years, the population was decreasing at a rate of 14 per year.

3. Ethan is running a race. The function $s(t)$ gives the distance (in miles) that Ethan has run after t seconds.

What is the best interpretation for the following statement?

- A. After 3 seconds, Ethan was running at a rate of 14 miles per second.
 B. During the first 3 seconds, Ethan ran 14 miles.
 C. After 3 seconds, Ethan was running at a rate of 14 miles per second.
 D. After 3 seconds, Ethan was running at a rate of 14 miles per second.

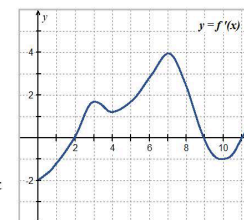
4. The function $f(x)$ is defined on the closed interval $[0, 12]$ and has a first derivative whose graph is shown at right.

- A. On the interval $[0, 3]$, $f(x)$ is increasing.
 B. Until $x = 3$, $f(x)$ is increasing.
 C. On the interval $[3, 7]$, $f(x)$ is increasing.
 D. On the interval $[7, 11]$, $f(x)$ is increasing.

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A twice-differentiable function, $f(x)$, is defined on the closed interval $[0, 12]$ and has a first derivative whose graph is shown at right. The graph of $f'(x)$ has horizontal tangent lines at $x = 3$, $x = 4$, $x = 7$, and $x = 10$.

NOTE: We will consider open intervals to define both intervals of increase/decrease and concave behaviors.



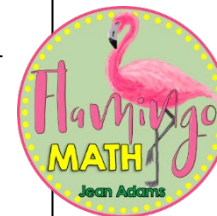
Each of the following answers to the problems presented below contain an error that would likely not earn full credit on a Free Response Question from the AP Calculus exam. Circle or highlight the part of the answer that contains the error or lack of clarity.

Problem Set 1: Determine the x -value(s) where $f(x)$ has a relative (local) maximum. Justify your answer.

Student Response	Correct or Incorrect? Why?
A. The relative maximum occurs at $x = 9$ because it changes signs from positive to negative at $x = 9$.	
B. The relative maximum of $f(x)$ occurs at $x = 3$ and $x = 7$.	
C. The relative maximum occurs at $x = 9$ because $f'(x)$ changes signs from negative to positive at $x = 9$.	
D. The relative maximum occurs at $x = 2$ and $x = 11$ because the value of $f'(x)$ changes signs from negative to positive at $x = 2$ and $x = 11$.	
E. The relative maximum occurs at $x = 9$ because $f(x)$ changes from increasing to decreasing at $x = 9$.	
F. The relative maximum occurs at $x = 9$ because the graph changes signs from positive to negative at $x = 9$.	
G. The relative maximum occurs at $x = 9$ because the graph of $f'(x)$ is concave downward at $x = 9$.	
H. The relative maximum occurs at $x = 9$ because the derivative changes signs from positive to negative at $x = 9$.	

Write a correct answer and justification for this question:

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What are the benefits of a digital Google Slides resource?

BENEFITS OF A DIGITAL RESOURCE:

- Great for the 1:1 classroom
- Easy access through a laptop, tablet, PC, or mobile device
- Paperless
- Self-Grading with data analysis
- Editable
- Final product can be printed
- Instant feedback



You and your students must have a free Google account in order to access and interact with the activity.

It is not necessary to use Google Classroom to use this resource.

