AP Calculus AB 2020 Practice Exam 3

Reminders:
Show all of your work, even though a question may not explicitly remind you to do so. Clearly label any functions, graphs, tables, or other objects that you use. Justifications require that you give mathematical reasons, and that you verify the needed conditions under which relevant theorems, properties, definitions, or tests are applied. Your work will be scored on the correctness and completeness of your methods as well as your answers. Answers without supporting work will usually not receive credit.

Unless otherwise specified, answers (numeric or algebraic) need not be simplified.

Unless otherwise specified, the domain of a function *f* is assumed to be the set of all real numbers *x* for which *f(x)* is a real number.

Calculators are permitted but are not required for any part of any question.

The test is open book/open note, but you may not consult with any other individuals.

Instructions:
Write your solution using dark pencil or ink on white paper. Label each part of each question. Write clearly and legibly. Cross out any errors you make; erased or crossed-out work will not be scored.

All pages need to be labeled with student AP ID number, student initials, and page number.

All students will be responsible for watching the timer themselves.

Set a 30 minute timer for Question 1. Practice keeping track of your time. When the timer has 5 minutes left, take a photo of your work and transfer it to the device you are using to access your questions. Do not move on to Question 2 until the time has finished for the first timer. (During the actual test, the second question will not appear until the 30 minutes have ended for Question 1.)

Set a 20 minute timer for Question 2. When the timer has 5 minutes left, take a photo of your work and transfer it to the device you are using the access your questions.

Structure:
Students must submit on the same device used to access the questions.
I recommend one of the following methods:

1. Access the questions on a laptop, complete the work on white paper, take a photo of the work using your phone, and then send the photo to the laptop (using Airdrop, or email it to yourself)
2. Access the questions on a tablet, complete the work on white paper, then take a photo of your work on the tablet.

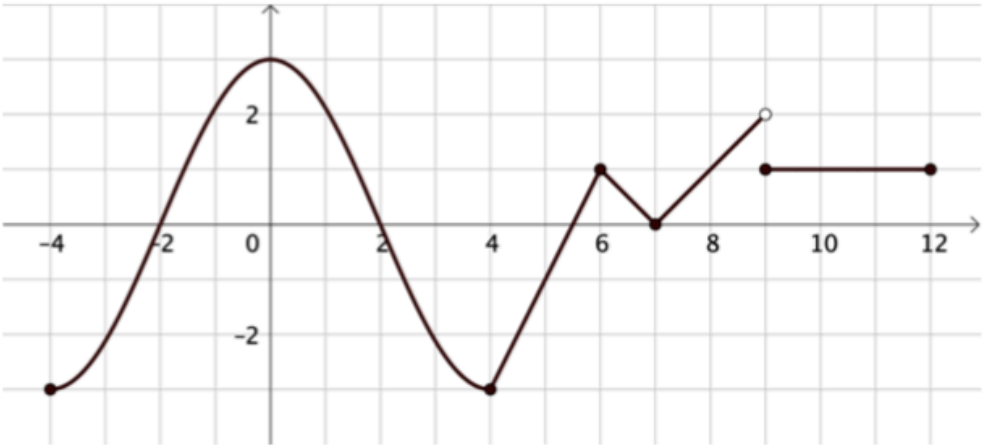
CALCULUS AB

Part A

Time—25 minutes

Number of problems—1

A GRAPHING CALCULATOR IS NOT REQUIRED FOR THESE PROBLEMS.



Graph of g'

1. Let g be a differentiable function such that $g(6) = -1$. The graph of g', the derivative of g, is shown above. On the interval $-4 \le x \le 4$, $g'(x) = 3\cos\left(\frac{\pi x}{4}\right)$.
   (a) Find the average rate of change of g' on the interval $-4 \le x \le 6$. Give an exact answer.
   (b) Find the average rate of change of g on the interval $-4 \le x \le 6$. Give an exact answer.
   (c) Write the equation of the line tangent to the graph of g at $x = 2$.
   (d) Find the absolute maximum value of g on the interval $-4 \le x \le 12$.
   (e) Find the value of $\lim_{x \to 8} \dfrac{2 - \sqrt[3]{x}}{g(x)}$ or state that it does not exist. Justify your answer.
   (f) Give the x-coordinates of all points of inflection on the graph of $g(x)$. Justify your answer.
   (g) For each of $g''(2)$ and $g''(9)$, find the exact value or explain why it does not exist.
   (h) On what open intervals contained in $-4 \le x \le 12$ is the graph of g both decreasing and concave up? Justify your answer.

CALCULUS AB

Part B

Time—15 minutes

Number of problems—1

A GRAPHING CALCULATOR IS NOT REQUIRED FOR THESE PROBLEMS.

t (minutes)	0	12	20	24	40
$v(t)$ (meters per minute)	0	200	240	–220	150

Johanna jogs along a straight path. For $0 \le t \le 40$, Johanna's velocity is given by a differentiable function v. Selected values of $v(t)$, where t is measured in minutes and $v(t)$ is measured in meters per minute, are given in the table above.

a) Use the data in the table to estimate the value of $v'(16)$. Using correct units, interpret the meaning of this value in context.

b) Approximate the value of $\int_0^{40} |v(t)| dt$ using a right Riemann sum with the four subintervals indicated in the table.

c) Bob is riding his bicycle along the same path. For $0 \le t \le 10$, Bob's velocity is modeled by $B(t) = t^3 - 6t^2 + 300$, where t is measured in minutes and $B(t)$ is measured in meters per minute. Find Bob's acceleration at time $t = 5$.

d) When $t = 5$ minutes, is Bob's speed increasing, decreasing, or neither? Explain.

e) Based on the model $B(t)$ from part c, find Bob's average acceleration on the interval $0 \le t \le 10$. Include units on your answer.