

AP<sup>®</sup>

 CollegeBoard

# 2020 Exam Sample Questions

---

AP<sup>®</sup> CALCULUS AB

## 2020 Exam Sample Question 1

(Adapted from: 2019 AP<sup>®</sup> Calculus AB Exam Questions)

**General Notes:** The questions you will see on the 2020 AP Calculus Exam are similar to questions you might have seen on items used on past AP Calculus Exams. The practice item below is constructed from items from the 2019 AP Calculus AB Exam, with minor modifications:

- Question 1, below, combines elements from more than one question from the 2019 exam so that you can practice working on a 25-minute question.
- Certain parts of 2019 questions were modified from the original to make them calculator neutral.
- Other parts might have been omitted, because the assessed content was taken from an excluded unit.

Whether you decide to keyboard or handwrite your responses, be careful to communicate clearly:

- Begin by labeling the part of the question you are working on.
- Be careful to use parentheses correctly.
- Leave numeric answers in unsimplified form.
- Be sure to upload your response before the clock counts all the way down.

**Directions:** The use of a graphing calculator is permitted. A calculator is not required to answer any parts of the question. Show all of your work, even though the 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. If your answer is given as a decimal approximation, it should be correct to three places after the decimal point. 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.

### Sample Question 1

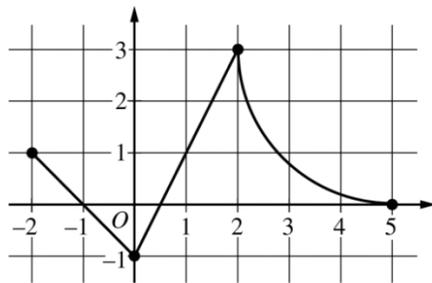
Allotted time: 25 minutes (plus 5 minutes to submit)

$t$ (hours)	0	0.3	1.7	2.8	4
$v_p(t)$ (meters per hour)	0	55	-29	55	48

The velocity of a particle,  $P$ , moving along the  $x$ -axis is given by the differentiable function  $v_p(t)$ , where  $v_p(t)$  is measured in meters per hour and  $t$  is measured in hours. Selected values of  $v_p(t)$  are shown in the table above. Particle  $P$  is at the origin at time  $t = 0$ .

- (a) Justify why there must be at least one time  $t$ , for  $0.3 \leq t \leq 2.8$  at which  $v'_p(t)$ , the acceleration of particle  $P$ , equals 0 meters/hour/hour.
- (b) Use a trapezoidal sum with the three subintervals  $[0, 0.3]$ ,  $[0.3, 1.7]$ , and

$[1.7, 2.8]$  to approximate the value of  $\int_0^{2.8} v_p(t) dt$ .



Graph of  $f$

The continuous function  $f$  is defined on the closed interval  $-6 \leq x \leq 5$ . The figure above shows a portion of the graph of  $f$ , consisting of two line segments and a quarter of a circle centered at the point  $(5, 3)$ . It is known that the point  $(3, 3 - \sqrt{5})$  is on the graph of  $f$ .

- (c) If  $\int_{-6}^5 f(x) dx = 7$ , find the value of  $\int_{-6}^{-2} f(x) dx$ . Show the work that leads to your answer.
- (d) Evaluate  $\int_3^5 (2f'(x) + 4) dx$
- (e) The function  $g$  is given by  $g(x) = \int_{-2}^x f(t) dt$ . Find the absolute maximum value of  $g$  on the interval  $-2 \leq x \leq 5$ . Justify your answer.
- (f) Find  $\lim_{x \rightarrow 1} \frac{10^x - 3f'(x)}{f(x) - \arctan x}$ .
- (g) Suppose that  $g(x) = \int_{-2}^x f(t) dt$ . Is the rate of change in  $g$  increasing or decreasing at  $t = 1$ ? Explain your reasoning.

## Notes on 2020 Exam Question 2

The time allotted for 2020 Question 2 is 15 minutes (plus 5 minutes to submit). Most FRQs on traditional year AP Calculus AB exams are designed to take approximately that much time.

You are encouraged to practice both FRQ 4 and FRQ 6 from the 2019 AP Calculus AB exam