Name _____

Date: March 16, 2021 Teacher: Asher Roberts

AP Calculus BC Exam 3 Answer Sheet

Example: (A) (B) (●) (D) (E)

1. (A) (B) (C) (D) (E)
2. (A) (B) (C) (D) (E)
3. (A) (B) (C) (D) (E)
4. (A) (B) (C) (D) (E)
5. (A) (B) (C) (D) (E)
6. (A) (B) (C) (D) (E)
7. (A) (B) (C) (D) (E)
8. (A) (B) (C) (D) (E)
9. (A) (B) (C) (D) (E)
10. (A) (B) (C) (D) (E)
11. (A) (B) (C) (D) (E)
12. (A) (B) (C) (D) (E)
13. (A) (B) (C) (D) (E)
14. (A) (B) (C) (D) (E)
15. (A) (B) (C) (D) (E)

CALCULUS BC
SECTION I, Part A
Time—20 minutes
Number of questions—10

A CALCULATOR MAY NOT BE USED ON THIS PART OF THE EXAM.

Directions: Solve each of the following problems, using the available space for scratch work. After examining the form of the choices, decide which is the best of the choices given and fill in the corresponding circle on the answer sheet. One credit will be given for each correct answer. Do not spend too much time on any one problem.

In this exam:

(1) 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.

(2) The inverse of a trigonometric function f may be indicated using the inverse function notation f^{-1} or with the prefix "arc" (e.g., $\sin^{-1} x = \arcsin x$).

(for teacher use only)

Exam Score	
Part	**Number of Correct Answers**
A	
B	
Total:	
Overall Score:	

1. The length of the curve $y = \ln \sec x$ from $x = 0$ to $x = b$, where $0 < b < \dfrac{\pi}{2}$, may be expressed by which of the following integrals?

(A) $\displaystyle\int_0^b \sec x \, dx$

(B) $\displaystyle\int_0^b \sec^2 x \, dx$

(C) $\displaystyle\int_0^b (\sec x \tan x) \, dx$

(D) $\displaystyle\int_0^b \sqrt{1 + (\ln \sec x)^2} \, dx$

(E) $\displaystyle\int_0^b \sqrt{1 + (\sec^2 x \tan^2 x)} \, dx$

---

2. The acceleration α of a body moving in a straight line is given in terms of time t by $\alpha = 8 - 6t$. If the velocity of the body is 25 at $t = 1$ and if $s(t)$ is the distance of the body from the origin at time t, what is $s(4) - s(2)$?

(A) 20 (B) 24 (C) 28 (D) 32 (E) 42

3. A particle moves along the x-axis so that at any time t its position is given by $x(t) = te^{-2t}$. For what values of t is the particle at rest?

(A) No values (B) 0 only (C) $\frac{1}{2}$ only (D) 1 only (E) 0 and $\frac{1}{2}$

---

4. If $y'' = 2y'$ and if $y = y' = e$ when $x = 0$, then when $x = 1$, $y =$

(A) $\frac{e}{2}(e^2 + 1)$ (B) e (C) $\frac{e^3}{2}$ (D) $\frac{e}{2}$ (E) $\frac{(e^3 - e)}{2}$

5. $\int \arcsin x \, dx =$

(A) $\sin x - \int \dfrac{x \, dx}{\sqrt{1-x^2}}$

(B) $\dfrac{(\arcsin x)^2}{2} + C$

(C) $\arcsin x + \int \dfrac{dx}{\sqrt{1-x^2}}$

(D) $x \arccos x - \int \dfrac{x \, dx}{\sqrt{1-x^2}}$

(E) $x \arcsin x - \int \dfrac{x \, dx}{\sqrt{1-x^2}}$

---

6. $\int \dfrac{dx}{(x-1)(x+2)} =$

(A) $\dfrac{1}{3} \ln \left| \dfrac{x-1}{x+2} \right| + C$

(B) $\dfrac{1}{3} \ln \left| \dfrac{x+2}{x-1} \right| + C$

(C) $\dfrac{1}{3} \ln |(x-1)(x+2)| + C$

(D) $(\ln |x-1|)(\ln |x+2|) + C$

(E) $\ln |(x-1)(x+2)^2| + C$

7. If three equal subdivisions of $[-4, 2]$ are used, what is the trapezoidal approximation of $\displaystyle\int_{-4}^{2} \frac{e^{-x}}{2}\,dx$?

(A) $e^2 + e^0 + e^{-2}$ (B) $e^4 + e^2 + e^0$ (C) $e^4 + 2e^2 + 2e^0 + e^{-2}$

(D) $\dfrac{1}{2}(e^4 + e^2 + e^0 + e^{-2})$ (E) $\dfrac{1}{2}(e^4 + 2e^2 + 2e^0 + e^{-2})$

---

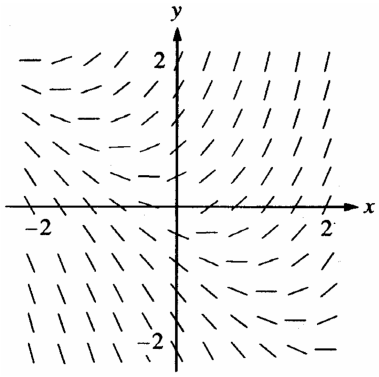
8. If $\dfrac{dy}{dx} = y \sec^2 x$ and $y = 5$ when $x = 0$, then $y =$

(A) $e^{\tan x} + 4$ (B) $e^{\tan x} + 5$ (C) $5e^{\tan x}$

(D) $\tan x + 5$ (E) $\tan x + 5e^x$

9. Bacteria in a certain culture increase at a rate proportional to the number present. If the number of bacteria doubles in three hours, in how many hours will the number of bacteria triple?

(A) $\dfrac{3\ln 3}{\ln 2}$ (B) $\dfrac{2\ln 3}{\ln 2}$ (C) $\dfrac{\ln 3}{\ln 2}$ (D) $\ln\left(\dfrac{27}{2}\right)$ (E) $\ln\left(\dfrac{9}{2}\right)$



10. Shown above is a slope field for which of the following differential equations?

(A) $\dfrac{dy}{dx} = 1 + x$ (B) $\dfrac{dy}{dx} = x^2$ (C) $\dfrac{dy}{dx} = x + y$ (D) $\dfrac{dy}{dx} = \dfrac{x}{y}$ (E) $\dfrac{dy}{dx} = \ln y$

CALCULUS BC
SECTION I, Part B
Time—15 minutes
Number of questions—5

A GRAPHING CALCULATOR IS REQUIRED FOR SOME QUESTIONS ON THIS PART OF THE EXAM.

Directions: Solve each of the following problems, using the available space for scratch work. After examining the form of the choices, decide which is the best of the choices given and fill in the corresponding circle on the answer sheet. One credit will be given for each correct answer. Do not spend too much time on any one problem.

YOU MAY NOT RETURN TO PROBLEMS 1-10 OF THE ANSWER SHEET.

In this exam:

(1) The exact numerical value of the correct answer does not always appear among the choices given. When this happens, select from among the choices the number that best approximates the exact numerical value.

(2) 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.

(3) The inverse of a trigonometric function f may be indicated using the inverse function notation f^{-1} or with the prefix "arc" (e.g., $\sin^{-1} x = \arcsin x$).

11. $\int x^2 \sin x \, dx =$

(A) $-x^2 \cos x - 2x \sin x - 2 \cos x + C$
(B) $-x^2 \cos x + 2x \sin x - 2 \cos x + C$
(C) $-x^2 \cos x + 2x \sin x + 2 \cos x + C$
(D) $-\frac{x^3}{3} \cos x + C$
(E) $2x \cos x + C$

---

t (sec)	0	2	4	6
$a(t)$ (ft/sec^2)	5	2	8	3

12. The data for the acceleration $a(t)$ of a car from 0 to 6 seconds are given in the table above. If the velocity at $t = 0$ is 11 feet per second, the approximate value of the velocity at $t = 6$, computed using a left-hand Riemann sum with three subintervals of equal length, is

(A) 26 ft/sec (B) 30 ft/sec (C) 37 ft/sec (D) 39 ft/sec (E) 41 ft/sec

13. A particle moves along the x-axis so that at any time $t \geq 0$, its velocity is given by $v(t) = \cos(2 - t^2)$. The position of the particle is 3 at time $t = 0$. What is the position of the particle when its velocity is first equal to 0?

(A) 0.411
(B) 1.310
(C) 2.816
(D) 3.091
(E) 3.411

---

14. Water is pumped out of a lake at the rate $R(t) = 12\sqrt{\dfrac{t}{t+1}}$ cubic meters per minute, where t is measured in minutes. How much water is pumped from time $t = 0$ to $t = 5$?

(A) 9.439 cubic meters
(B) 10.954 cubic meters
(C) 43.816 cubic meters
(D) 47.193 cubic meters
(E) 54.772 cubic meters

15. For what value of k, if any, is $\displaystyle\int_0^\infty kxe^{-2x}\,dx = 1$?

(A) $\dfrac{1}{4}$

(B) 1

(C) 4

(D) Any positive value of k.

(E) There is no such value of k.