Name _____

Date: December 18, 2018 Teacher: Asher Roberts

AP Calculus BC Exam 2 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. Two credits will be given for each correct answer, and one credit may be given for incorrect answers where there is correct work written in the exam book. 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**	**Number of Partially Correct Answers**
A		
B		
Total:		
	Overall Score:	

1. The Mean Value Theorem guarantees the existence of a special point on the graph of $y = \sqrt{x}$ between $(0, 0)$ and $(4, 2)$. What are the coordinates of this point?

(A) $(2, 1)$

(B) $(1, 1)$

(C) $(2, \sqrt{2})$

(D) $\left(\frac{1}{2}, \frac{1}{\sqrt{2}}\right)$

(E) None of the above

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2. $\int_0^8 \frac{dx}{\sqrt{1+x}} =$

(A) 1 (B) $\frac{3}{2}$ (C) 2 (D) 4 (E) 6

3. For what value of k will $x + \dfrac{k}{x}$ have a relative maximum at $x = -2$?

(A) -4 (B) -2 (C) 2 (D) 4 (E) None of these

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4. The point on the curve $x^2 + 2y = 0$ that is nearest the point $\left(0, -\dfrac{1}{2}\right)$ occurs where y is

(A) $\dfrac{1}{2}$
(B) 0
(C) $-\dfrac{1}{2}$
(D) -1
(E) none of the above

5. If $F(x) = \displaystyle\int_0^x e^{-t^2}\,dt$, then $F'(x) =$

(A) $2xe^{-x^2}$ (B) $-2xe^{-x^2}$ (C) $\dfrac{e^{-x^2+1}}{-x^2+1} - e$

(D) $e^{-x^2} - 1$ (E) e^{-x^2}

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6. The region bounded by the x-axis and the part of the graph of $y = \cos x$ between $x = -\dfrac{\pi}{2}$ and $x = \dfrac{\pi}{2}$ is separated into two regions by the line $x = k$. If the area of the region for $-\dfrac{\pi}{2} \le x \le k$ is three times the area of the region for $k \le x \le \dfrac{\pi}{2}$, then $k =$

(A) $\arcsin\left(\dfrac{1}{4}\right)$ (B) $\arcsin\left(\dfrac{1}{3}\right)$ (C) $\dfrac{\pi}{6}$ (D) $\dfrac{\pi}{4}$ (E) $\dfrac{\pi}{3}$

7. The graph of $y = 5x^4 - x^5$ has a point of inflection at

(A) $(0, 0)$ only (B) $(3, 162)$ only (C) $(4, 256)$ only

(D) $(0, 0)$ and $(3, 162)$ (E) $(0, 0)$ and $(4, 256)$

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8. At $x = 0$, which of the following is true of the function f defined by $f(x) = x^2 + e^{-2x}$?

(A) f is increasing.
(B) f is decreasing.
(C) f is discontinuous.
(D) f has a relative minimum.
(E) f has a relative maximum.

9. What is $\lim_{x \to 0} \dfrac{e^{2x} - 1}{\tan x}$?

(A) -1 (B) 0 (C) 1 (D) 2 (E) The limit does not exist.

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10. Which of the following is equal to $\lim_{n \to \infty} \sum_{k=1}^{n} \left(\sqrt{1 + \dfrac{3k}{n}} \cdot \dfrac{1}{n} \right)$?

(A) $\displaystyle\int_0^1 \sqrt{1 + 3x}\,dx$ (B) $\displaystyle\int_0^3 \sqrt{1 + x}\,dx$ (C) $\displaystyle\int_1^4 \sqrt{x}\,dx$

(D) $\dfrac{1}{3}\displaystyle\int_0^3 \sqrt{x}\,dx$ (E) $\dfrac{1}{3}\displaystyle\int_1^4 \sqrt{1 + x}\,dx$

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. Two credits will be given for each correct answer, and one credit may be given for incorrect answers where there is correct work written in the exam book. 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. When the region enclosed by the graphs of $y = x$ and $y = 4x - x^2$ is revolved about the x-axis, the volume of the solid generated is given by

(A) $\pi \int_0^3 \left(x^3 - 3x^2\right) dx$

(B) $\pi \int_0^3 \left(\left(4x - x^2\right)^2 - x^2\right) dx$

(C) $\pi \int_0^3 \left(3x - x^2\right)^2 dx$

(D) $2\pi \int_0^3 \left(x^3 - 3x^2\right) dx$

(E) $2\pi \int_0^3 \left(3x^2 - x^3\right) dx$

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12. If $0 \leq x \leq 4$, of the following, which is the greatest value of x such that $\int_0^x (t^2 - 2t)dt \geq \int_2^x tdt$?

(A) 1.35 (B) 1.38 (C) 1.41 (D) 1.48 (E) 1.59

13. The base of a solid is the region in the first quadrant enclosed by the graph of $y = 2 - x^2$ and the coordinate axes. If every cross section of the solid perpendicular to the y-axis is a square, the volume of the solid is given by

(A) $\pi \int_0^2 (2-y)^2 dy$

(B) $\int_0^2 (2-y) dy$

(C) $\pi \int_0^{\sqrt{2}} (2-x^2)^2 dx$

(D) $\int_0^{\sqrt{2}} (2-x^2)^2 dx$

(E) $\int_0^{\sqrt{2}} (2-x^2) dx$

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14. A force of 10 pounds is required to stretch a spring 4 inches beyond its natural length. Assuming Hooke's law applies, how much work is done in stretching the spring from its natural length to 6 inches beyond its natural length?

(A) 60.0 inch-pounds

(B) 45.0 inch-pounds

(C) 40.0 inch-pounds

(D) 15.0 inch-pounds

(E) 7.2 inch-pounds

15. Of the following, which is the closest to the average value of $y = x^2\sqrt{x^3+1}$ on the interval $[0, 2]$?

(A) 2.889
(B) 5.778
(C) 8.667
(D) 17.333
(E) 24

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16. (EXTRA CREDIT). Prove that the product of even functions is even, the product of an even function and an odd function is odd, and the product of odd functions is even.