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# AP Calculus BC

## Q1 Interim Assessment

## Test Booklet 2

## Multiple Choice - Calculator

## October 2016

School: _____

Student Name: _____

Teacher: _____

Period: _____

# AP® Calculus BC Exam

## SECTION I: Multiple Choice

**DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO.**

### At a Glance

**Total Time**
1 hour, 45 minutes
**Number of Questions**
45
**Percent of Total Score**
50%
**Writing Instrument**
Pencil required

**Part A**

**Number of Questions**
30
**Time**
60 minutes
**Electronic Device**
None allowed

**Part B**

**Number of Questions**
15
**Time**
45 minutes
**Electronic Device**
Graphing calculator required

### Instructions

Section I of this exam contains 45 multiple-choice questions. For Part A, fill in only the boxes for numbers 1 through 30 on the answer sheet. For Part B, fill in only the boxes for numbers 76 through 90 on the answer sheet.

Indicate all of your answers to the multiple-choice questions on the answer sheet. No credit will be given for anything written in this exam booklet, but you may use the booklet for notes or scratch work. After you have decided which of the suggested answers is best, place the letter of your choice in the corresponding box on the answer sheet. Give only one answer to each question.

Use your time effectively, working as quickly as you can without losing accuracy. Do not spend too much time on any one question. Go on to other questions and come back to the ones you have not answered if you have time. It is not expected that everyone will know the answers to all of the multiple-choice questions.

Your total score on the multiple-choice section is based only on the number of questions answered correctly. Points are not deducted for incorrect answers or unanswered questions.

B B B B B B B B B

**CALCULUS BC**

**SECTION I, PART B**

**Time – 45 minutes**

**Number of questions – 15**

**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, decided which is the best of the choices fiven and place the letter of your choice in the corresponding box on the answer sheet. No credit will be given for anything written in this exam booklet. Do not spend too much time on any one problem.

**In this exam:**
(1) The exact numerical value of the correct answer does not always appears 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 by using the inverse function $f^{-1}$ or with the prefix "arc" (e.g. $\sin^{-1} x = \arcsin x$).

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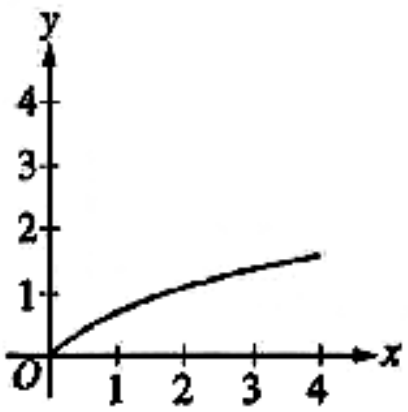


76. The graph of the function $f$ is shown above for $0 \le x \le 4$. Of the following, which has the greatest value?

(A) $\int_0^4 f(x)\,dx$

(B) Left Riemann sum approximation of $\int_0^4 f(x)\,dx$ with 4 subintervals of equal length.

(C) Right Riemann sum approximation of $\int_0^4 f(x)\,dx$ with 4 subintervals of equal length.

(D) Not enough information to determine which has the greatest value.

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77. The derivative of the function $f$ is given by $f'(x) = x^3 \sin(x^2 - 2)$. How many points of inflection does the graph of $f$ have on the open interval $(-3, 3)$?

(A) One (B) Four (C) Five (D) Six

B B B B B B B B B

78. Let $f$ be a function that is continuous on the closed interval $[2, 4]$ with $f(2) = 10$ and $f(4) = 20$. Which of the following is guaranteed by the Intermediate Value Theorem?

(A) $f(x) = 13$ has at least one solution in the open interval $(2, 4)$.

(B) $f(3) = 15$.

(C) $f'(x) = 5$ has at least one solution in the open interval $(2, 4)$.

(D) $f'(x) > 0$ for all $x$ in the open interval $(2, 4)$.

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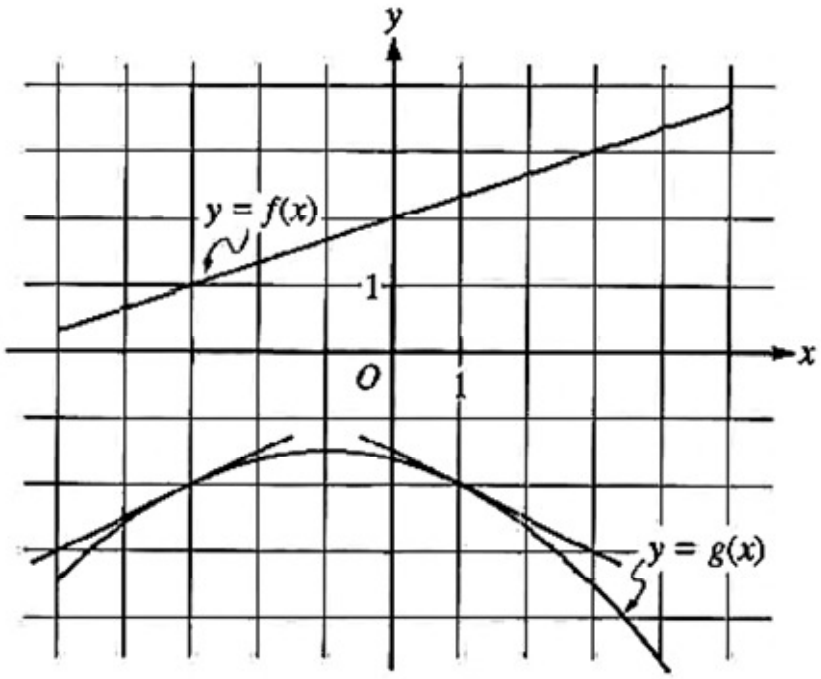


79. The figure above shows the graphs of the functions $f$ and $g$. The graphs of the lines tangent to the graphs of $g$ at $x = -3$ and $x = 1$ are also shown. If $B(x) = g(f(x))$, what is $B'(-3)$?

(A) $-\frac{1}{2}$ (B) $-\frac{1}{6}$ (C) $\frac{1}{6}$ (D) $\frac{1}{2}$

B B B B B B B B B

80. If $\int_{700}^{900} f(x)\,dx = -C$ and $\int_{400}^{700} f(x)\,dx = D$, then $\int_{900}^{400} f(x)\,dx =$

(A) $C + D$

(B) $C - D$

(C) 0

(D) $D - C$

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81. The volume of a cylindrical tin can with a top and a bottom is to be $4\pi$ cubic inches. If a minimum amount of tin is to be used to construct the can, what must be the radius, in inches, of the can?

(A) $\sqrt[3]{2}$

(B) $\sqrt{2}$

(C) 2

(D) $\sqrt[3]{4}$

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$$f(x) = \begin{cases} ax - b & \text{for} \quad x \leq -1 \\ x^2 - ax & \text{for} \quad x > -1 \end{cases}$$

82. Let $f$ be the function defined above, where $c$ and $d$ are constants. If $f$ is differentiable at $x = -1$, what is the value of $a + b$?

(A) $-2$ (B) $-1$ (C) 1 (E) 2

B B B B B B B B B

83. Let $f$ be the function given by $f(x) = \int_{1/3}^{x} \cos\left(\frac{1}{t^2}\right) dt$ for $\frac{1}{3} \leq x \leq 1$. At which of the following values of $x$ does $f$ attain a relative maximum?

(A) 0.357 and 0.798

(B) 0.4 and 0.564

(C) 0.4 only

(D) 0.461

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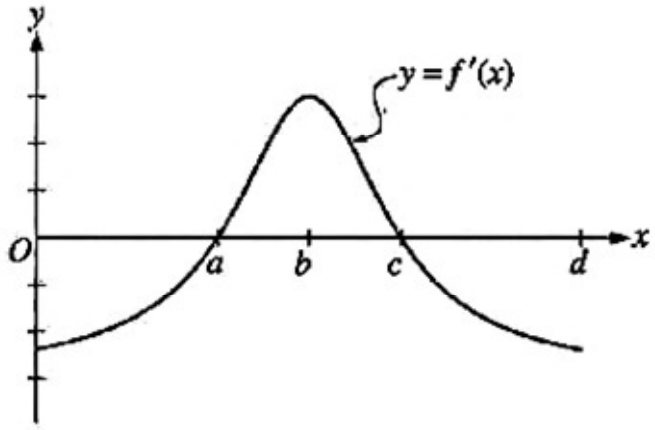


84. The graph of $f'$, the derivative of a function $f$, is shown above. The domain of $f$ is the open interval $0 < x < d$. Which of the following statements is true?

(A) $f$ has a local maximum at $x = b$.

(B) The graph of $f$ has a point of inflection at $(a, f(a))$.

(C) The graph of $f$ has a point of inflection at $(b, f(b))$.

(D) The graph of $f$ is concave up on the open interval $(c, d)$.

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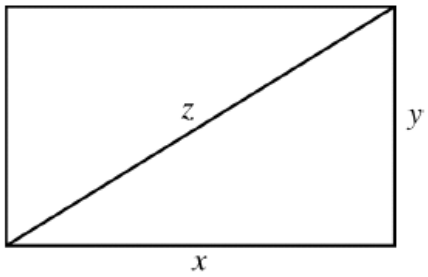


85. The sides and diagonal of the rectangle above are strictly increasing with time. At the instant when $x = 4$ and $y = 3$, $\frac{dx}{dt} = \frac{dz}{dt}$ and $\frac{dy}{dt} = k\frac{dz}{dt}$. What is the value of $k$ at that instant?

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

(B) $\frac{1}{3}$

(C) 3

(D) 4

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86. $\int \frac{3x^2+6x}{6\sqrt{x}} dx =$

(A) $\frac{1}{2}x^{3/2} + x^{1/2} + C$

(B) $\frac{1}{5}x^{5/2} + \frac{2}{3}x^{3/2} + C$

(C) $\frac{3}{4}x^{1/2} + \frac{1}{2}x^{-1/2} + C$

(D) $\frac{x^3+5x^2}{4x^{3/2}} + C$

B B B B B B B B B

87. The function $g(t)$ represents the rate at which gravel is poured into the back of a dump truck in pounds/second. Which of the following statements is the best interpretation of $\int_0^{60} g(t)\,dt = 1800$?

(A) At $t = 60$, there is a total of 1800 pounds of gravel in the back of the dump truck.

(B) At $t = 60$, the rate at which the gravel is pouring is increasing by 1800 pounds per minute per minute.

(C) At $t = 30$, the gravel is pouring at a rate of 1800 pounds per minute

(D) From $t = 0$ to $t = 60$, the 1800 pounds of gravel was poured into the back of the dump truck.

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88. Consider the functions $f$ and $g$ given by $f(x) = \ln x$ and $g(x) = \frac{1}{8}\sin(2x)$. At what value of $x$ do the graphs of $f$ and $g$ have perpendicular tangent lines?

(A) $-0.225$

(B) $-0.121$

(C) $1.105$

(D) $5.872$

B B B B B B B B B

89. The velocity of a particle traveling on the $x$-axis is given by the function $v(t) = e^6 - 6$, where $0 \le t \le 3$. Which of the following expression represents the total distance traveled by the particle over the interval $[0,3]$?

(A) $\int_3^{\ln 6}(e^t - 6)dt + \int_{\ln 6}^{0}(e^t - 6)dt$

(B) $\int_{\ln 6}^{3}(e^t - 6)dt - \int_0^{\ln 6}(e^t - 6)\,dt$

(C) $\int_0^{\ln 6}(e^t - 6)dt + \int_{\ln 6}^{3}(e^t - 6)dt$

(D) $\int_0^3(e^t - 6)dt$

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90. If $f(x) = (\cos x)^{\sqrt{x}}$, then $f'(x) =$

(A) $\sqrt{x} * (\cos x)^{\sqrt{x}-1} * (-\sin x)$

(B) $(\cos x)^{\sqrt{x}} * \left[\frac{\ln(\cos x)}{2\sqrt{x}} - \sqrt{x} * \tan x\right]$

(C) $(\cos x)^{\sqrt{x}} * \left[\frac{\ln(\cos x)}{2\sqrt{x}} - \sqrt{x} * \cot x\right]$

(D) $(\cos x)^{\sqrt{x}} * \left[\frac{\ln(\cos x)}{2\sqrt{x}} + \frac{\sqrt{x}}{\cos x}\right]$

**END OF SECTION I**

**IF YOU FINISH BEFORE TIME IS CALLED,**
**YOU MAY CHECK YOUR WORK ON PART B ONLY.**

**DO NOT GO ON TO SECTION II UNTIL YOU ARE TOLD TO DO SO.**