



**AP Calculus AB**  
**Q2 Interim Assessment**  
**January 2016**

**Section I – Part B (50 Minutes)**  
**Calculators Allowed**

Student Name: \_\_\_\_\_

School: \_\_\_\_\_

Teacher: \_\_\_\_\_

## SECTION I – PART B DIRECTIONS

**50 Minutes: 17 Multiple Choice** (1 point each)

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 bubble on the answer sheet. No credit will be given for anything written in the test book. You may use a calculator.

In this test:

- (1) The exact numerical value of the correct answer does not always appear among the answer 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.,  $\sin^{-1} x = \arcsin x$ ).

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**76. A particle moves along a straight line with velocity given by  $v(t) = (t^2 - 3t)e^{-t^2}$  at time  $t \geq 0$ . What is the acceleration of the particle at time  $t = 2$ ?**

- (A) -0.1648
- (B) -0.0366
- (C) -0.0183
- (D) 0.0183
- (E) 0.1648

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

- (A) One
- (B) Two
- (C) Three
- (D) Four
- (E) Five

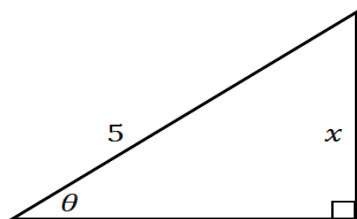
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78. Which of the following is an equation of the tangent line to the graph of  $f(x) = e^x + x^2$  at the point where  $f'(x) = 2$ ?

- (A)  $y = 2x - 0.630$
- (B)  $y = 2x + 0.537$
- (C)  $y = 2x + 0.839$
- (D)  $y = 2x + 0.926$
- (E)  $y = 2x + 1.469$

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79. In the triangle shown below, if  $\theta$  increases at a constant rate of 3 radians per minute, at what rate is  $x$  increasing in units per minute when  $x$  equals 3 units?



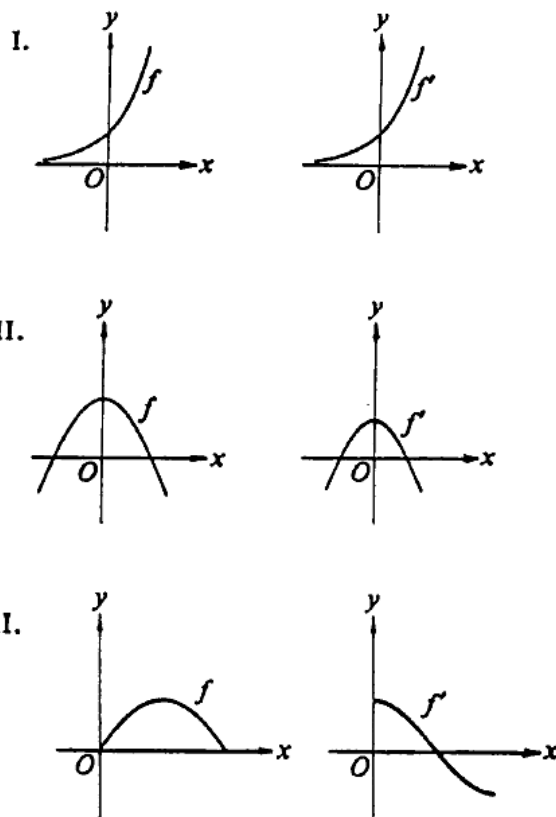
- (A) 3
- (B)  $\frac{15}{4}$
- (C) 4
- (D) 9
- (E) 12

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80. Let  $f$  be the function with the first derivative defined by  $f'(x) = x^2 - 4x - 5 - e^{\cos x}$  for  $(-10, 10)$ . At what value of  $x$  does  $f$  attain its minimum value on the open interval  $(-10, 10)$ ?

- (A) -9.826
- (B) -1.225
- (C) 0
- (D) 1.431
- (E) 5.271

81. Which of the following pairs of graphs could represent the graph of a function and the graph of its derivative?



(A) I only

(B) II only

(C) III only

(D) I and III

(E) II and III

82. Let  $f$  be the function defined below, where  $c$  and  $d$  are constants. If  $f$  is differentiable at  $x = 2$ , what is the value of  $c + d$ ?

$$f(x) = \begin{cases} cx + d & x \leq 2 \\ x^2 - cx & x > 2 \end{cases}$$

(A) -4

(B) -2

(C) 0

(D) 2

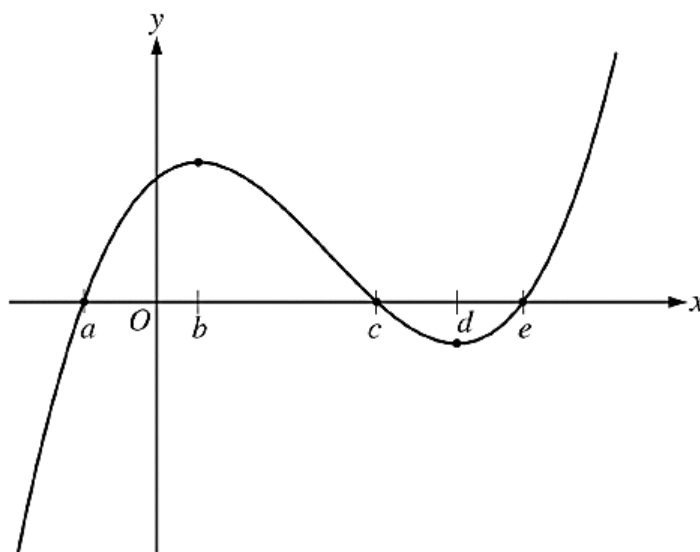
(E) 4

83. Let  $f$  be the function with derivative given by  $f'(x) = \sin(x^2 + 1)$ . How many relative extrema does  $f$  have on the interval  $2 < x < 4$ ?

- (A) One
- (B) Two
- (C) Three
- (D) Four
- (E) Five

84. The figure below shows the graph of the polynomial function  $f$ . For which value of  $x$  is it true that  $f''(x) < f'(x) < f(x)$ ?

- (A)  $a$
- (B)  $b$
- (C)  $c$
- (D)  $d$
- (E)  $e$



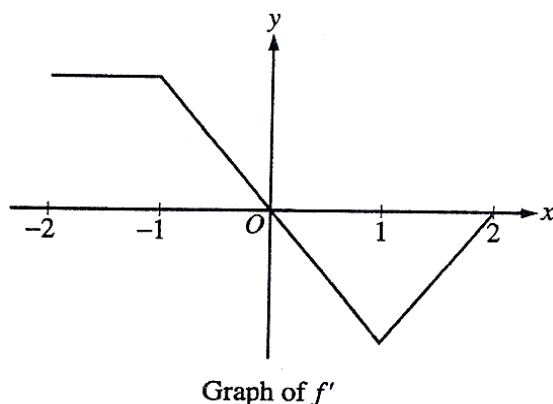
Graph of  $f$

85. Let  $f$  be a function such that  $f''(x) < 0$  for all  $x$  in the closed interval  $[1, 2]$ . Selected values of  $f$  are shown in the table below. Which of the following must be true about  $f'(1.2)$ ?

$x$	1.1	1.2	1.3	1.4
$f(x)$	4.18	4.38	4.56	4.73

- (A)  $f'(1.2) < 0$
- (B)  $0 < f'(1.2) < 1.6$
- (C)  $1.6 < f'(1.2) < 1.8$
- (D)  $1.8 < f'(1.2) < 2.0$
- (E)  $f'(1.2) > 2.0$

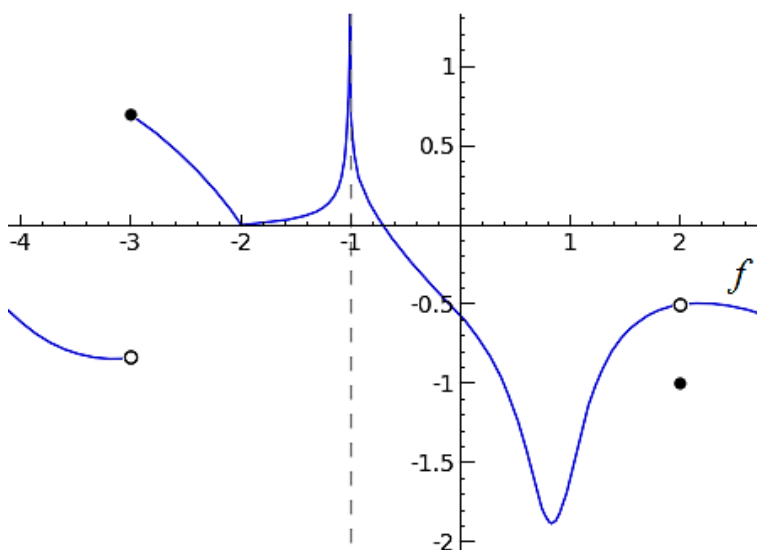
86. The graph of  $f'$ , the derivative of the function  $f$ , is shown below. Which of the following statements is true about  $f$ ?



- (A)  $f$  is decreasing for  $-1 \leq x \leq 1$ .
- (B)  $f$  is increasing for  $-2 \leq x \leq 0$ .
- (C)  $f$  is increasing for  $1 \leq x \leq 2$ .
- (D)  $f$  has a local minimum at  $x = 0$ .
- (E)  $f$  is not differentiable at  $x = -1$  and  $x = 1$ .

87. The figure below shows the graph of a function  $f$ , where  $f$  has a vertical asymptote at  $x = -1$ . Which of the following statements are true?

- I.  $\lim_{x \rightarrow -3} f(x)$  exists
- II.  $\lim_{x \rightarrow 2} f(x)$  exists
- III.  $\lim_{x \rightarrow -1} f(x) = \infty$



- (A) II only
- (B) III only
- (C) I and II
- (D) II and III
- (E) I, II, and III

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88. Let  $f$  be a function with a second derivative given by  $f''(x) = x(x-5)(x+2)^2$ . What are the  $x$ -coordinates of the points of inflection of the graph of  $f$ ?

- (A)  $-2$  only      (B)  $5$  only      (C)  $0$  and  $5$  only      (D)  $5$  and  $-2$  only      (E)  $0, 5$ , and  $-2$
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89. If  $p$  is a differentiable function such that  $p(x) < 0$  for all real numbers  $x$  and if  $m'(x) = (x^2 - 100)p(x)$ , which of the following is true?

- (A)  $m$  has a relative maximum at  $x = -10$  and a relative minimum at  $x = 10$ .  
(B)  $m$  has a relative minimum at  $x = -10$  and a relative maximum at  $x = 10$ .  
(C)  $m$  has relative minima at  $x = -10$  and at  $x = 10$ .  
(D)  $m$  has relative maxima at  $x = -10$  and at  $x = 10$ .  
(E) It cannot be determined if  $f$  has any relative extrema.
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90. If  $\int_9^{15} f(x)dx = 8$ , then  $\int_{15}^9 (2f(x) + 10)dx =$

- (A)  $-76$       (B)  $-26$       (C)  $44$       (D)  $52$       (E)  $76$
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91. If  $f(x) = \sec^{10}\left(\frac{x}{5}\right)$ , then  $f'(x) =$

- (A)  $2\sec\left(\frac{x}{5}\right)\tan\left(\frac{x}{5}\right)$
- (B)  $-2\sec^9\left(\frac{x}{5}\right)\tan\left(\frac{x}{5}\right)$
- (C)  $2\sec^9\left(\frac{x}{5}\right)\tan\left(\frac{x}{5}\right)$
- (D)  $2\sec^{10}\left(\frac{x}{5}\right)\tan\left(\frac{x}{5}\right)$
- (E)  $10\sec^{10}\left(\frac{x}{5}\right)\tan\left(\frac{x}{5}\right)$

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92. The function  $f$  is continuous for  $[-2, 1]$  and differentiable for  $(-2, 1)$ . If  $f(-2) = -5$  and  $f(1) = 4$ , which of the following statements could be false?

- (A) There exists a value  $c$  on the interval  $(-2, 1)$ , such that  $f(c) = 0$ .
- (B) There exists a value  $c$  on the interval  $(-2, 1)$ , such that  $f'(c) = 0$ .
- (C) There exists a value  $c$  on the interval  $(-2, 1)$ , such that  $f(c) = 3$ .
- (D) There exists a value  $c$  on the interval  $(-2, 1)$ , such that  $f'(c) = 3$ .
- (E) There exists a value  $c$  on the interval  $[-2, 1]$ , such that  $f(c) \geq f(x)$  for all  $x$  on the closed interval  $[-2, 1]$ .

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**END OF SECTION I**

IF YOU FINISH BEFORE TIME IS CALLED, YOU MAY CHECK YOUR WORK ON THIS PART ONLY.  
DO NOT GO ON TO SECTION II UNTIL YOU ARE TOLD TO DO SO.

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