Uncommon Schools | Change History.

AP Calculus AB

Q1 Interim Assessment

Test Booklet 1

Multiple Choice - Non-Calc

October 2016

School: _____

Student Name: _____

Teacher: _____

Period: _____

AP® Calculus AB 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.

CALCULUS AB

SECTION I, Part A

Time – 60 minutes

Number of questions – 30

NO CALCULATOR IS ALLOWED FOR THIS PART OF THE EXAM.

Directions: Solve each of the following problems, using the available space for scratch work. After examining the form for the choices, decide which of the choices given 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.

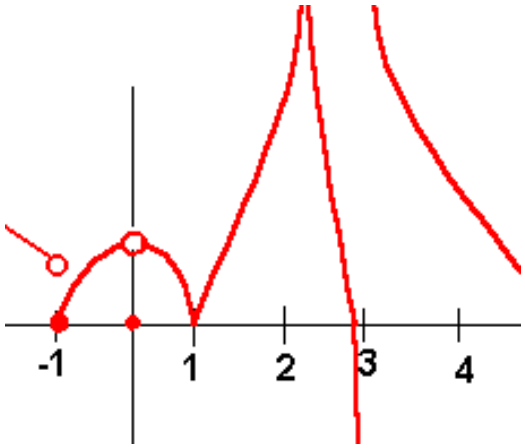
In this exam:

(1) 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., $\sin^{-1} x = \arcsin x$).

1. $\lim_{x\to 5} \frac{x^2-25}{x^2+5x-50}$ is

(A) $-\frac{2}{3}$ (B) $\frac{2}{3}$ (C) 1 (D) Nonexistent



Graph of f

2. The graph of a function *f* is shown above. At which value of *x* is *f* continuous, but not differentiable?

(A) -1 (B) 0 (C) 1 (D) 3

3. The instantaneous rate of change of the function $f(x) = \frac{x^2-2x}{x-1}$ at $x = 3$ is

(A) $-\frac{5}{2}$ (B) $-\frac{5}{4}$ (C) $\frac{5}{4}$ (D) $\frac{5}{2}$

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4. If $f(x) = \cos^2(5-x)$, then $f'(2) =$

(A) $-2\sin 3\cos 3$

(B) $10\cos 3$

(C) $2\sin 3\cos 3$

(D) $10\sin 3\cos 3$

5. What are the values of x for which the function f defined by $f(x) = -x^3 - 3x^2 + 45x - 90$ is increasing?

(A) $-5 < x < 3$

(B) $-3 < x < 5$

(C) $x < -5$ or $x > 3$

(D) $x < -3$ or $x > 5$

---

6. $\lim_{x \to 10} \frac{e^{x+5} - e^{15}}{x - 10} =$

(A) 0

(B) e^{10}

(C) e^{15}

(D) Nonexistent

7. The function f is twice differentiable with $f(4) = 6$, $f'(4) = 3$, and $f''(4) = 2$. What is the value of the approximation of $f(3.9)$ using the tangent line to the graph of f at $x = 4$?

(A) 5.7

(B) 5.9

(C) 6.2

(D) 6.3

---

8. Let *f* be the function defined by the following:

$$f(x) = \begin{cases} \sin x & x < 0 \\ x^2 & 0 \le x < 1 \\ 2 - x & 1 \le x < 2 \\ x - 1 & x \ge 2 \end{cases}$$

For what values of *x* is *f* NOT continuous?

(A) 1 only (B) 2 only (C) 0 and 2 only (D) 0, 1, and 2

9. If $f(x) = \ln\left(\sqrt{x}\right)$, then $f''(x) =$

(A) $-\frac{2}{x^2}$ (B) $-\frac{1}{2x^2}$ (C) $-\frac{1}{2x}$ (D) $-\frac{1}{2x^{3/2}}$

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10. What is the *x*–coordinate of the point of inflection on the graph of $y = \frac{1}{3}x^3 - 3x^2$?

(A) – 6 (B) – 3 (C) 3 (D) 6

11. Let f be the function defined by $f(x) = 2x^3 - 8x + 6$. Which of the following is the equation of the line normal to the graph of f at the point where $x = -1$?

(A) $y = -2x - 2$

(B) $y = -2x + 10$

(C) $y = \frac{1}{2}x + 10$

(D) $y = \frac{1}{2}x + 12.5$

---

12. $\lim_{x \to \infty} \frac{(x-3)(2x-2)}{(6-x)(x-1)}$

(A) -2 (B) -1 (C) 1 (D) ∞

13. If $f(x) = x^2 \sin 2x$, find $f'(x)$.

(A) $4x\cos 2x$

(B) $2x(\sin 2x + \cos 2x)$

(C) $2x(\sin 2x - x\cos 2x)$

(D) $2x(\sin 2x + x\cos 2x)$

---

14. Let $f(x) = 4x - 2$ and $g(x) = x^3$. Find $\lim_{x \to 1} g\big(f(x)\big)$.

(A) 2 (B) 1 (C) 8 (D) –4

$$f(x)=\begin{cases} x^2-3x+9 & x\le 2 \\ kx+1 & x>2 \end{cases}$$

15. The function f is defined above. For what value of k, if any, is f continuous at $x = 2$?

(A) 1 (B) 2 (C) 3 (D) 7

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16. If $\ln(2x+y)=x+1$, then $\frac{dy}{dx}=$

(A) -2

(B) $2x+y-2$

(C) $2x+y$

(D) $4x+2y-2$

17. If $f'(x) = (x+2)(x-1)^2(x-3)^3$, then f has which of the following relative extrema?

I. A relative maximum at $x = -2$

II. A relative minimum at $x = 1$

III. A relative maximum at $x = 3$

(A) I only

(B) I and III only

(C) II and III only

(D) I, II, and III

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18. If $y = \sin^{-1}(5x)$, then $\frac{dy}{dx} =$

(A) $\frac{5}{1+25x^2}$

(B) $\frac{-5}{\sqrt{1-25x^2}}$

(C) $\frac{1}{\sqrt{1-25x^2}}$

(D) $\frac{5}{\sqrt{1-25x^2}}$

19. $\lim_{x\to 0}\dfrac{\sin x-\sin x\cos x}{x^2}$ is

(A) – 1 (B) 0 (C) 1 (D) Nonexistent

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20. What is $\lim_{h\to 0}\dfrac{\csc\left(\dfrac{\pi}{4}+h\right)-\csc\left(\dfrac{\pi}{4}\right)}{h}$?

(A) $-\sqrt{2}$ (B) –1 (C) $\sqrt{2}$ (D) Undefined

21. If the function f is continuous for all real numbers and if $f(x) = \dfrac{x^2 - 10x + 24}{x - 6}$ when $x \neq 6$, then $f(6) =$

(A) 0 (B) 2 (C) 6 (D) 12

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22. The function g is given by $g(x) = 4x^3 + 3x^2 - 6x + 1$. What is the absolute minimum value of g on the closed interval $[-2,1]$?

(A) -7
(B) $-\frac{3}{4}$
(C) 2
(D) 6

23. If $f(x) = \sec(2x)$, then $f'(x) =$

(A) $2\tan^2(2x)$

(B) $\tan(2x)\sec(2x)$

(C) $2\tan(2x)\sec(2x)$

(D) $-2\sin(2x)\sec^2(2x)$

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24. Let f be the function given by $f(x) = 10xe^x$. The graph of f is concave down when

(A) $x < -2$ (B) $x > -2$ (C) $x < -1$ (D) $x > -1$

25. If $f(x)=\dfrac{x}{\tan x}$, then $f'\left(\dfrac{\pi}{4}\right)=$

(A) 2

(B) $\dfrac{1}{2}$

(C) $\dfrac{\pi}{2}-1$

(D) $1-\dfrac{\pi}{2}$

---

26. If $f(x)=\left(x^5+1\right)^3$, then $f'(x)=$

(A) $3\left(x^5+1\right)$

(B) $3\left(5x^4+1\right)$

(C) $5x^4\left(x^5+1\right)^2$

(D) $15x^4\left(x^5+1\right)^2$

27. $\lim_{x \to -\infty} \frac{2 - e^x}{1 + 3^x}$ is

(A) $-\infty$

(B) $-\frac{e}{3}$

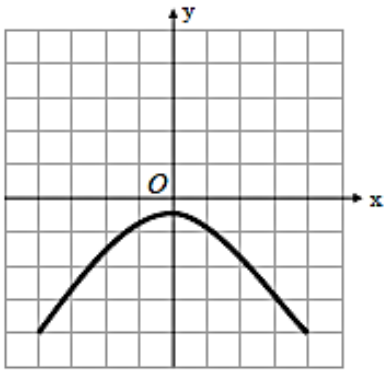
(C) 0

(D) 2

---

28. The function *f* has the property that $f(x) < 0$, $f'(x) > 0$, and $f''(x) < 0$ for all real values of *x*. Which of the following could be the graph of *f*?

A)



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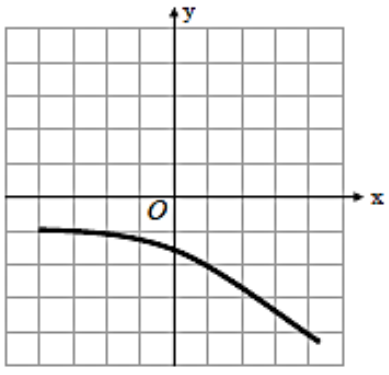

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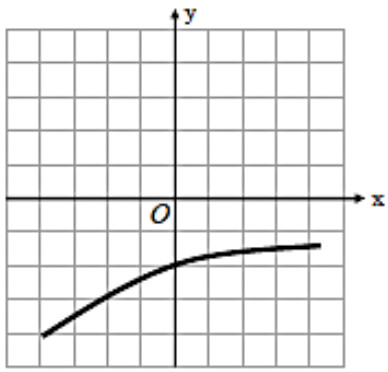

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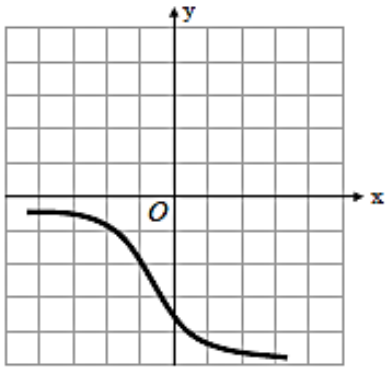

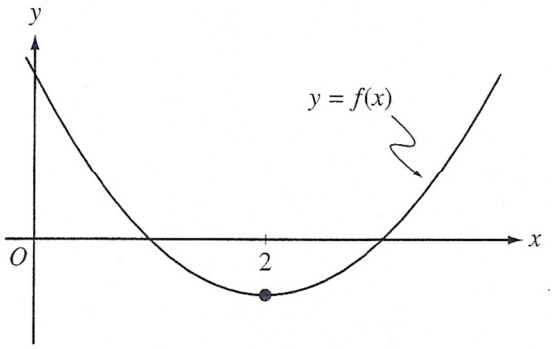

29. The graph of the twice differentiable function $f(x)$ is shown in the figure above. Which of the following statements is true?

(A) $f(2) < f'(2) < f''(2)$
(B) $f(2) < f''(2) < f'(2)$
(C) $f'(2) < f(2) < f''(2)$
(D) $f'(2) < f''(2) < f(2)$

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30. 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 $x = 10$.

END OF PART A

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

DO NOT GO ON TO PART B UNTIL YOU ARE TOLD TO DO SO