Uncommon Schools | Change History.

AP Calculus AB

Q2 Interim Assessment

January 2016

Section I – Part A (55 Minutes)

NO Calculators Allowed

Student Name: _____

School: _____

Teacher: _____

SECTION I – PART A DIRECTIONS

55 Minutes: 28 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 not use a calculator.

In this test:

(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. $\lim_{x\to 5} \dfrac{x^2-25}{x-5}$ **is**

(A) –10
(B) 0
(C) 5
(D) 10
(E) Nonexistent

2. If $6 - xy = y^2$ **, what is** $\dfrac{dy}{dx}$ **at the point (–1, 3)?**

(A) $-\frac{3}{5}$ (B) $-\frac{3}{7}$ (C) $\frac{3}{7}$ (D) $\frac{3}{5}$ (E) $\frac{6}{5}$

3. If $f'(x) = x(x-4)^2(x+2)$, then *f* has which of the following extrema?

I. A relative maximum at $x = -2$
II. A relative minimum at $x = 0$
III. A relative maximum at $x = 4$

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

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4. A particle moves along the *x*-axis so that at time $t \geq 0$ its position is given by $x(t) = 5t^3 - 15t^2 - 45t$. At what time *t* is the particle at rest?

(A) $t = 1$ only
(B) $t = 3$ only
(C) $t = 0$ and $t = 1$
(D) $t = 0$ and t = 3
(E) $t = 1$ and t = 3

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5. If *f* is differentiable at *x* = *a*, which of the following could be false?

(A) *f* is continuous at $x = a$.
(B) $\lim_{x \to a} f(x)$ exists.
(C) $\lim_{x \to a} \frac{f(x) - f(a)}{x - a}$ exists.
(D) $f'(a)$ is defined.
(E) $f''(a)$ is defined.

6. What is the *x*-coordinate of the point of inflection on the graph of $y = \frac{2}{3}x^3 - 2x^2 + 7$?

(A) –1 (B) 1 (C) 2 (D) $\frac{13}{3}$ (E) $\frac{17}{3}$

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7. If $f(x) = \ln(\cos(3x))$, then $f'(x) =$

(A) $-3\csc(3x)$
(B) $3\sec(3x)$
(C) $3\tan(3x)$
(D) $-3\tan(3x)$
(E) $-3\cot(3x)$

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8. The function *f* is given by $f(x) = \begin{cases} e^{2x} & x < 0 \\ \cos(x) + 1 & x \geq 0 \end{cases}$

The limit $\lim_{x \to 0} f(x)$ is

(A) 0 (B) 1 (C) 2 (D) 3 (E) Nonexistent

9. The length of a rectangle is decreasing at a rate of 2 meters per second while the width of the rectangle is increasing at a rate of 2 meters per second. At the instant when the length of the rectangle is 5 meters and the width of the rectangle is 3 meters, what is the rate of change of the area of rectangle in square meters per second?

(A) -16 (B) -4 (C) 0 (D) 4 (E) 16

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10. The function *f* is continuous on the closed interval [2, 4] and twice differentiable on the open interval (2, 4). If $f'(3) = 2$ and $f''(x) < 0$ on the open interval (2, 4), which of the following could be a table of values of *f*?

(A)

x	$f(x)$
2	2.5
3	5
4	6.5

(B)

x	$f(x)$
2	2.5
3	5
4	7

(C)

x	$f(x)$
2	3
3	5
4	6.5

(D)

x	$f(x)$
2	3
3	5
4	7

(E)

x	$f(x)$
2	3.5
3	5
4	7.5

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11. Evaluate: $\lim_{x \to 0} x \csc x \sec x$

(A) –1
(B) 0
(C) 1
(D) 2
(E) Undefined

12. 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 $x > 5$

(E) All real numbers

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13. If $f(x) = (x-1)\left(x^2+2\right)^3$, then $f'(x) =$

(A) $6x(x^2+2)^2$

(B) $6x(x-1)(x^2+2)^2$

(C) $(x^2+2)^2(x^2+3x-1)$

(D) $(x^2+2)^2(7x^2-6x+2)$

(E) $-3(x-1)(x^2+2)^2$

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14. If $f(x) = \dfrac{x+3}{x^2+1}$, then $f'(-2) =$

(A) $-\dfrac{9}{25}$

(B) $-\dfrac{1}{4}$

(C) $\dfrac{1}{25}$

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

(E) $\dfrac{9}{25}$

15. If *c* is the number that satisfies the conclusion of the Mean Value Theorem for $f(x) = x^3 - 2x^2$ on the interval $[0, 2]$, then *c* =

(A) 0

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

(C) 1

(D) $\frac{4}{3}$

(E) 2

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16. Let *f* be a differentiable function such that $f(-4) = 5$, $f(2) = -4$, $f'(-4) = 6$, and $f'(2) = -1$. The function *g* is differentiable and $g(x) = f^{-1}(x)$ for all *x*. What is the value of $g'(-4)$?

(A) –1

(B) $-\frac{1}{4}$

(C) $\frac{1}{6}$

(D) $\frac{1}{2}$

(E) The value of $g'(-4)$ cannot be determined from the information given.

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17. $\int_{-4}^{6} (3x - 6)dx =$

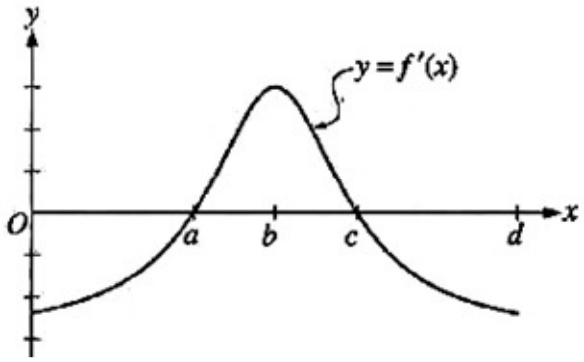
(A) -30 (B) -15 (C) 75 (D) 78 (E) 150

18. The table below gives values of the differentiable functions *f* and *g* and of their derivatives *f'* and *g'*, at selected values of *x*. If $h(x) = f\big(g(x)\big)$, what is the slope of the graph of *h* at *x* = 2?

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
-1	-5	1	3	0
0	-2	0	1	1
1	0	-3	0	0.5
2	5	-1	5	2

(A) – 10 (B) – 6 (C) 5 (D) 6 (E) 10

19. The graph of *f'*, the derivative of a function *f*, is shown below. The domain of *f* is (0, d). Which of the following statements is true?



(A) *f* has a local minimum at *x* = c.

(B) *f* has a local maximum at *x* = b.

(C) The graph of *f* has a point of inflection at *x* = a.

(D) The graph of *f* has a point of inflection at *x* = b.

(E) The graph of *f* is concave up on the interval (c, d).

20. The function $f(x) = 80x^3 + 15x^4 - 6x^5$ has a relative minimum at x =

(A) -4

(B) -2

(C) 0

(D) 2

(E) 4

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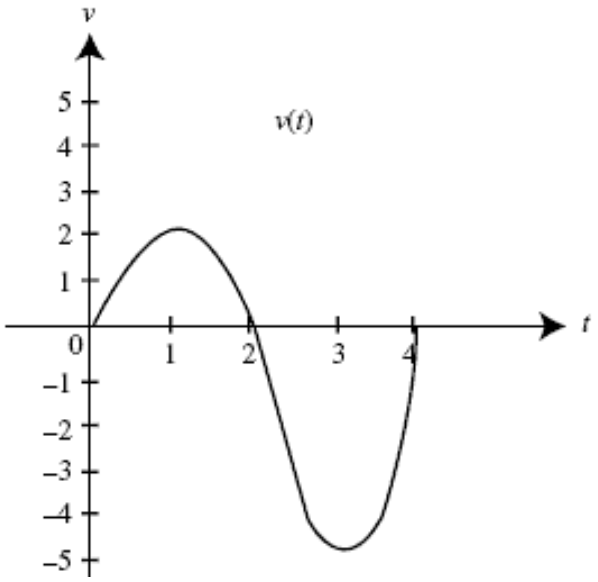
21. The velocity of a particle moving along the x-axis is shown below for $0 < t < 4$. The graph has horizontal tangents at $t = 1$ and $t = 3$, and a zero at $t = 2$. For what values of t is the speed of the particle decreasing?



(A) $1 < t < 3$ only

(B) $2 < t < 3$ only

(C) $2 < t < 4$ only

(D) $1 < t < 2$ and $3 < t < 4$

(E) $0 < t < 1$ and $3 < t < 4$

22. Given $f(x) = x^3 - 3x^2 + 12$ on the closed interval $[-2, 4]$, the absolute minimum occurs at *x* =

(A) –2 (B) 0 (C) 1 (D) 2 (E) 4

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23. $\lim_{x \to \infty} \frac{(2-x)(4+3x)}{(x+1)(x+6)}$ **is**

(A) -3 (B) -1 (C) 1 (D) 8 (E) nonexistent

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24. The value of $\int_0^6 |x-4|\,dx$ **is**

(A) –6
(B) –2
(C) 10
(D) 18
(E) 20

25. 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) 5.8 (C) 5.9 (D) 6.2 (E) 6.3

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26. Let *f* be the function given by $f(x)=-x^4+8x^3$. The graph of *f* is concave down when

(A) $-4<x<0$

(B) $0<x<4$

(C) $0<x<6$

(D) $x<-4$ and $x>0$

(E) $x<0$ and $x>4$

27. 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) $D - C$

(E) 500

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28. $\lim_{h \to 0} \frac{\tan^{-1}\left(-\sqrt{3}+h\right) - \tan^{-1}\left(-\sqrt{3}\right)}{h} =$

(A) $-\frac{\pi}{3}$

(B) $-\frac{1}{2}$

(C) $-\frac{1}{4}$

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

(E) $\frac{1}{2}$

END OF SECTION I – PART A

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