Calculus Midterm Review II: Derivatives

Name: _____   **Date:** _____

1. f and g are differentiable functions and have the values shown in the table.

   If $A = 5f - 8g$, then $A'(0) =$

   A. 0

   B. 3

   C. 61

   D. 7

x	f	f'	g	g'
0	5	1	-7	$\frac{1}{4}$
2	8	3	-5	1
4	14	9	-3	4
6	26	27	-1	16

2. The functions f and g are differentiable and have the values shown in the table.

   If $A = f \cdot g$, then $A'(4) =$

   A. 0   B. 114   C. 83   D. 29

3. The functions f and g are differentiable and have the values shown in the table.

   If $A = \left(\dfrac{1}{g}\right)$, then $A'(4) =$

   A. 0   B. $\frac{4}{9}$ C. $-\frac{4}{9}$ D. $-\frac{1}{4}$

4. The functions f and g have the values shown in the table and are differentiable.

   If $A = \left(\dfrac{f}{g}\right)$, then $A'(2) =$

   A. $-\frac{23}{4}$ B. $\frac{23}{4}$ C. -7 D. $-\frac{23}{25}$

5. The functions f and g are differentiable and have the values shown in the table.

   If $A = f\left(g(x)\right)$, then $A'(-8) =$

   A. -72

   B. 54

   C. 9

   D. -9

x	f	f'	g	g'
-8	4	3	-2	6
-6	10	12	0	9
-2	20	9	6	18
2	30	15	12	24

6. f and g are differentiable functions and have the values shown in the table.

   If $A = \sqrt{f(x)}$, then $A'(-2) =$

   A. $\frac{9}{8}$

   B. impossible

   C. $\frac{8}{9}$

   D. 3

x	f	f'	g	g'
-8	4	3	-2	6
-6	10	12	0	9
-2	16	9	6	18
2	30	11	12	24

7. The functions f and g are differentiable and have the values shown in the table.

   If $A = f(x^3)$, then $A'(-2) =$

   A. -18

   B. 9

   C. -120

   D. 36

x	f	f'	g	g'
-8	4	3	-2	6
-6	10	12	0	9
-2	16	9	6	18
2	30	15	12	24

8. Given functions f and g, which are differentiable and have the values shown in the table.

   If $A = f^{-1}$, then $A'(4) =$

   A. 12

   B. 3

   C. $\frac{1}{12}$

   D. $\frac{1}{3}$

x	f	f'	g	g'
2	4	3	8	6
4	10	12	6	9
6	16	26	4	18
8	30	40	2	24

9. A twice differentiable function f is given by the table.

   Estimate $f''(4.6)$:

x	3.7	4.3	4.9	5.5	6.1
$f(x)$	1.8	3.4	4.6	6.4	8.4

   A. 4.900   B. 0.278   C. 3.593   D. 2.500

10. The table shows the position of an object moving along a line at 10 second intervals.

Estimate the velocity, in units/sec, at $t = 15$.

t (sec)	0	10	20	30	40
position	4	12	26	44	68

A. 0.140
B. −0.714

C. 0.714
D. 1.400

11. The table shows the velocity of an object moving along a line at 2 second intervals.
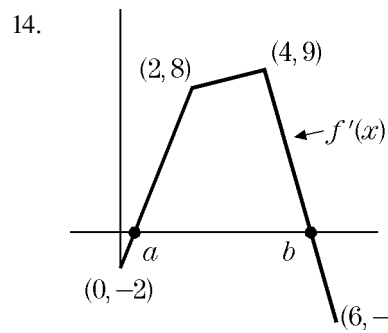
Estimate the acceleration, in units/sec², at $t = 10$.

t (sec)	10	12	14	16	18
v (units/sec)	18.0	22.8	27.6	33.4	42.2

A. 1.800
B. 0.417

C. −0.417
D. 2.400

12. At which of the five points shown on the graph are $\dfrac{dy}{dx}$ and $\dfrac{d^2y}{dx^2}$ both positive?
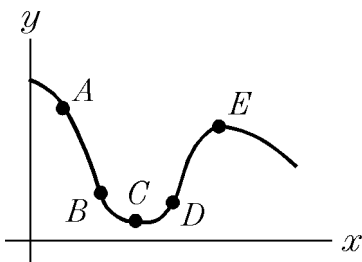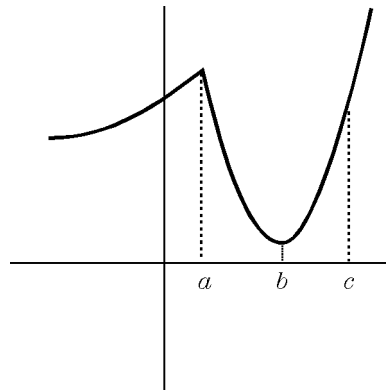

A. B
B. C
C. D
D. E

13. At which of the five points shown on the graph is $\dfrac{d^2y}{dx^2}$ negative? Choose the *best* answer.

A. A and E
B. C only

C. B, C, and D
D. E only

14.

The graph of f' is shown. If $f(2) = 17$, then $f(0) = $ _____ .

A. 1   B. −1   C. −33   D. 10

15. Which of the following tables goes best with the graph of f?

A.
x	$f'(x)$
a	0
b	0
c	4

B.
x	$f'(x)$
a	0
b	0
c	−2

C.
x	$f'(x)$
a	does not exist
b	0
c	6.2

D.
x	$f'(x)$
a	does not exist
b	does not exist
c	−1

16. Let f be defined by $f(x) = (x^2 - 1)^4$ for all real numbers x. For what values of x is the function increasing?

   A. $(-1, 1)$

   B. $(-1, 0)$

   C. $(-1, 0)$ and $(1, \infty)$

   D. $(-\infty, -1)$ and $(1, \infty)$

17. Let $f(x) = x^2(x - 3)$. Over what interval is the function decreasing?

   A. $0 < x < 2$

   B. $0 < x < \infty$

   C. $-\infty < x < \infty$

   D. $-\infty < x < 0$ and $x > 2$

18. If $f(x) = \frac{1}{2}\sin 2x$ for $0 \le x < 2\pi$, determine the interval(s) over which the function is increasing.

   A. $0 < x < \frac{\pi}{2}$ and $\frac{3\pi}{2} < x < \frac{\pi}{2}$

   B. $0 < x < \frac{\pi}{4}$, $\frac{3\pi}{4} < x < \frac{5\pi}{4}$ and $\frac{7\pi}{4} < x < 2\pi$

   C. $\frac{\pi}{4} < x < \frac{3\pi}{4}$

   D. $0 < x < \frac{\pi}{4}$

19. Given that $f'(x) < 0$ for all x in the domain of f.

   What can be said about the number of solutions of $f(x) = 10$?

   A. 0

   B. 1

   C. 0 or 1

   D. not enough information

20. Show that $f(x) = x^2 - 3x + 2$ satisfies Rolle's Theorem on $[1, 2]$ and find the corresponding value of c that the theorem guarantees.

21. Why does Rolle's Theorem not apply to $f(x) = |x - 3|$ on the interval $[-1, 7]$?

22. Given $f(x) = \ln(x - 2) + \sin x$. Find the first non-negative interval, $[a, b]$, for which Rolle's Theorem applies and find the corresponding value of c.

23. Given the function $f(x) = x(x^2 - 8) - 5$ satisfies the hypothesis of the Mean Value Theorem on the interval $[1, 4]$, find a number C in the interval $(1, 4)$ which satisfies this theorem.

   A. $\sqrt{5}$ B. $\sqrt{7}$ C. 12   D. 5

24. Given $f(x) = \sqrt[3]{x}$ on $[-1, 5]$. Why does f not satisfy the hypothesis of the Mean Value Theorem?

   A. $f'(-1)$ does not exist

   B. $f'(0)$ does not exist

   C. f is not continuous on $[-1, 5]$

   D. f is not differentiable for $x < 0$

25. What is the tangent line approximation to $y = x^3 - 7x + 3$ for values of x near 2?

   A. $y = -3 - 5(x + 2)$ B. $y = -3 + 5(x - 2)$

   C. $y = -3 - 5(x - 2)$ D. $y = 3 - 5(x + 2)$

26. What is the average rate of change over $3 \le t \le 7$?

t	3	5	7	9	11
$f(t)$	1.2	4.6	8.2	13.4	20.4

   A. 3.5   B. 1.75   C. 0.286   D. -1.75

27. The position of an object is given by $s = t^2 - 3t + 8$. What is its average velocity for $3 \le t \le 5$?

   A. 4   B. 3.333   C. 5   D. 0.2

28. Find all points of inflection of the function $f(x) = x^4 - x^3$.

   A. $(0, 0)$

   B. $(0, 0)$ and $(\frac{1}{2}, -\frac{1}{16})$

   C. $(\frac{1}{2}, -\frac{1}{16})$

   D. $(\frac{1}{2}, -\frac{1}{16})$ and $(\frac{3}{4}, -\frac{27}{256})$

29. Let f be defined by $f(x) = x + 1 - (\cos x)^2$. Find the x-coordinates of all inflection points of f, $\frac{\pi}{6} \le x \le \frac{5\pi}{6}$.

   A. $\frac{\pi}{4}$ B. $\frac{\pi}{4}, \frac{3\pi}{4}$ C. $\frac{\pi}{2}, \frac{3\pi}{4}$ D. $\frac{\pi}{2}, \frac{5\pi}{6}$

30. Find all intervals on which the function $y = 6x^3 - x^4$ is concave upward.

   A. $(-\infty, 0)$ and $(3, \infty)$ B. $(-\infty, 0)$ and $(6, \infty)$

   C. $(0, 3)$ D. $(3, 6)$

31. Find all intervals on which the function is concave downward: $f(x) = \dfrac{x^2 - 4}{x^2}$.

   A. $(-\infty, \infty)$

   B. $(-\infty, -2)$ and $(2, \infty)$

   C. $(-\infty, 0)$ and $(0, \infty)$

   D. $(-\infty, -2)$

32. Let $f''(x) = 4x^3 - 2x$ and let $f(x)$ have critical numbers -1, 0, and 1. Use the Second Derivative Test to determine if any of the critical numbers gives a relative maximum.

   A. -1 B. 1 C. ± 1 D. $0, \pm 1$

33. If $y = e^{x^2 - 3x}$, then $y' =$

   A. $(2x - 3)e^{x^2 - 3x}$ B. $2x - 3$

   C. $(x^2 - 3x)e^{x^2 - 3x}$ D. $(2x - 3)e^{2x - 3}$

34. If $y = e^{1/x}$, then $y' =$

   A. $-\dfrac{e^{1/x}}{x^2}$ B. $e^{1/x}$ C. $\dfrac{e^{1/x}}{x}$ D. $xe^{1/x}$

35. Find y' given $y = e^{\sin\sqrt{x}}$.

   A. $\dfrac{\cos\sqrt{x}}{2\sqrt{x}}e^{\sin\sqrt{x}}$ B. $(\cos\sqrt{x})e^{\sin\sqrt{x}}$

   C. $(\sin\sqrt{x})e^{\sin\sqrt{x}-1}$ D. $\dfrac{(\sin\sqrt{x})e^{\sin\sqrt{x}}}{\sqrt{x}}$

36. If $y = \ln(x^2 - x)$, then $\dfrac{dy}{dx} =$

   A. $\dfrac{2x - 1}{x(x - 1)}$ B. $\dfrac{2}{x}$

   C. $\dfrac{1}{x(x - 1)}$ D. $\dfrac{x(x - 1)}{2x - 1}$

37. If $y = \ln(e^{3x} - 5)$, then $\dfrac{dy}{dx} =$

   A. $\dfrac{1}{e^{3x} - 5}$ B. $\dfrac{3x - 5}{e^{3x} - 5}$

   C. $\dfrac{3e^{3x}}{e^{3x} - 5}$ D. $e^{3x} - 5$

38. Find y' given $3xe^y - 4 = x^2 y$.

   A. 0 B. $\dfrac{2xy - 3e^y}{3xe^y - x^2}$

   C. $\dfrac{e^y}{3xe^y - 4}$ D. $\ln 3x$

39. Find y' given $xe^y + 1 = xy$.

   A. 0 B. $\dfrac{y - e^y}{xe^y - x}$

   C. $\dfrac{y}{e^y - x}$ D. $\ln x$

Calculus Midterm Review II: Derivatives   01/12/2017

1.
Answer: B

2.
Answer: D

3.
Answer: C

4.
Answer: D

5.
Answer: B

6.
Answer: A

7.
Answer: D

8.
Answer: D

9.
Answer: B

10.
Answer: D

11.
Answer: D

12.
Answer: C

13.
Answer: A

14.
Answer: A

15.
Answer: C

16.
Answer: C

17.
Answer: A

18.
Answer: B

19.
Answer: C

20.
Answer: $\frac{3}{2}$

21.
Answer: not differentiable at $x = 3$

22.
Answer: $[2.594, 3.703]$, $c \approx 3.009$

23.
Answer: B

24.
Answer: B

25.
Answer: B

26.
Answer: B

27.
Answer: C

28.
Answer: B

29.
Answer: B

30.
Answer: C

31.
Answer: C

32.
Answer: A

33.
Answer: A

34.
Answer: A

35.
Answer: A

36.
Answer: A

37.
Answer: C

38.
Answer: B

39.
Answer: B