Calculus Midterm Review I: Limits
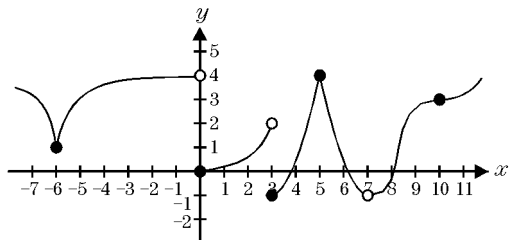
Name: _____   **Date:** _____

1. The figure below shows the graph of f. Use the figure to answer questions 1-4.

At which of the following x-values is f continuous? Choose the BEST answer.

    I.   –6

    II. 0

    III. 3

    IV. 5

    V. 7

    VI. 10

A. I, II, and IV   B. I, IV, and VI

C. II, III, and V   D. I and IV

2. At which of the following x-values does f have a removeable discontinuity? Choose the BEST answer.

    I.   –6

    II. 0

    III. 3

    IV. 5

    V. 7

    VI. 10

A. I, II, and IV   B. IV and VI

C. II, III, and V   D. V only

3. $\lim\limits_{x \to 7} f$ is

A. 1   B. 2   C. –1   D. 0

4. $\lim\limits_{x \to 0^-} f$ is

A. –1   B. 0   C. 4

D. no limit

5. $\lim\limits_{h \to 0} \dfrac{\sqrt{x+h} - \sqrt{x}}{h} =$

A. $2\sqrt{x}$ B. $\dfrac{1}{2\sqrt{x}}$

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

6. $\lim\limits_{\theta \to 0} \dfrac{\cos(\theta + h) - \cos\theta}{h} =$

A. $-\cos\theta$ B. $-\sin\theta$

C. $2\cos\theta$ D. $-2\cos\theta$

7. $\lim\limits_{x \to -3} \dfrac{1}{(x+3)^2} =$

A. 0   B. –3   C. $-\infty$ D. ∞

8. $\lim\limits_{x \to 3} \dfrac{\frac{1}{x} - \frac{1}{3}}{x - 3} =$

A. $-\frac{1}{9}$ B. $\frac{1}{27}$ C. $\frac{1}{9}$ D. $\frac{1}{3}$

9. If $f(x) = \begin{cases} -7 & \text{for } x = 4, \\ 2x + 7 & \text{for } x \neq 4 \end{cases}$ then $\lim\limits_{x \to 4} f(x) = $ _____.

10. Find A so that $\lim\limits_{x \to 2} \dfrac{x^2 + Ax - 10}{x - 2}$ exists.

11. $\lim\limits_{x\to 0} \dfrac{\sin 4x}{2x}$ is

    A. -2 B. 0 C. $\frac{1}{4}$ D. 2

12. $\lim\limits_{x\to 0} \dfrac{\sin 5x}{\sin 8x} =$

    A. $\frac{5}{8}$ B. 0 C. $\emptyset$ D. $\frac{8}{5}$

13. $\lim\limits_{x\to 0} \dfrac{x^2}{\tan^2 3x} =$

    A. $\frac{1}{9}$ B. $\frac{1}{3}$ C. $\emptyset$ D. $\frac{1}{6}$

14. $\lim\limits_{x\to 0} \dfrac{1 - \cos^2 x}{-4x^2}$ is

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

    C. $\sin x$ D. *undefined*

15. $\lim\limits_{x\to 1^+} \dfrac{1}{x - 1}$ is

    A. 1 B. 2 C. $-\infty$ D. ∞

16. $\lim\limits_{x\to 0^-} \dfrac{2x + 1}{x}$ is

    A. $-\infty$ B. 2 C. -2 D. ∞

17. $\lim\limits_{x\to 0^-} \dfrac{|x|}{x}$ is

    A. 1 B. -1 C. 0 D. ∞

18. $\lim\limits_{x\to \pi^-} \dfrac{\cos x}{x - \pi} =$

    A. ∞ B. does not exist

    C. $-\infty$ D. $\frac{1}{pi}$

19. $\lim\limits_{h\to \infty} \dfrac{5}{\sqrt{h + 7}}$ is

    A. 1 B. 0 C. 3 D. ∞

20. $\lim\limits_{x\to \infty} \dfrac{2x + 1}{x}$ is

    A. 0 B. 3 C. 2 D. ∞

21. $\lim\limits_{x\to \infty} \dfrac{x^2}{(1 - x)(1 + x)}$ is

    A. 1 B. -1 C. 0 D. ∞

22. Which of the following functions has a horizontal asymptote at $y = -\frac{1}{2}$?

    A. $\dfrac{x^3}{1 - 2x^3}$ B. $\dfrac{x}{\sqrt{2x + 1}}$

    C. $\dfrac{x - 1}{2x^2 + 1}$ D. $\dfrac{2x - 5}{1 - 4x^2}$

23. Given a function defined by $f(x) = \dfrac{3x - 12}{x^2 - 6x + 8}$, for what value(s) of x is the function discontinuous?

    A. 4 only   B. 2

    C. 2, 4   D. $-4, -2$

24. Which of the following functions are continuous for all real numbers x ?

    I. $y = \dfrac{1}{x}$

    II. $y = 2^x$

    III. $y = \sec x$

    A. II only   B. II and III only

    C. I and II only   D. I only

25. Which of the following functions are continuous for all real numbers x?

      I. $y = (x+2)^2$

      II. $y = \sqrt{2x^2 - x^3}$

      III. $y = 4\ln x$

    A.   I only   B.   I and II only

    C.   I and III only   D.   I, II, and III

26. Given a function is defined by $f(x) = \dfrac{2x+2}{x^2 + 5x + 4}$, for what value(s) of x does the function have one or more vertical asymptotes?

    A.   1 only   B. -4 only

    C.   4 only   D.   1 and 4

27. Let f be defined as follows:

$$f(x) = \begin{cases} \dfrac{x^2 - 16}{x - 4} & \text{for } x \neq 4, \\ 15 & \text{for } x = 4 \end{cases}$$

Which of the following are true about f?

      I. $\lim\limits_{x \to 4} f(x)$ exists

      II. $f(4)$ exists

      III. $f(x)$ is continuous at $x = 4$

    A.   None   B.   I only

    C.   II only   D.   I and II only

28. Consider the function

$$f(x) = \begin{cases} x^2 & \text{for } -2 < x < 2, \\ 4 & \text{for } x \geq 2, \\ 5 & \text{for } x \leq -2 \end{cases}$$

At $x = -2$ the function has

    A.   a jump discontinuity

    B.   a removable discontinuity

    C.   a point at which the function is continuous

    D.   a point at which the function is differentiable

29. $f(x) = \begin{cases} x^2 + 8 & \text{for } x < 8, \\ a^2 x & \text{for } x \geq 8 \end{cases}$

For what value(s) of a is the function continuous?

    A. ± 3 B.   64   C. -9 D.   18

30. f is continuous on $[2, 4]$ and has the values shown.

The equation $f(x) = 3$ must have at least 2 solutions on $[2, 4]$ for $k = $ _____ .

    A.   3   B.   4

    C.   2   D.   6

| x	2	3	4
$f(x)$	5	k	9

31. Consider $f(x) = \begin{cases} x + c & \text{for } x < 3, \\ cx^2 + 5 & \text{for } x \geq 3 \end{cases}$

For what value of the constant c is f continuous for all real numbers?

32. Use the Intermediate Value Theorem to show that $x^5 = 3^x$ has a solution.

33. The function f is shown. Which of the following are true for f on the open interval (a, c)?

      I.   The domain of the derivative of f is the open interval (a, c).

      II. f is continuous on the open interval (a, c).

      III.   The derivative of f is positive on the open interval (a, c).
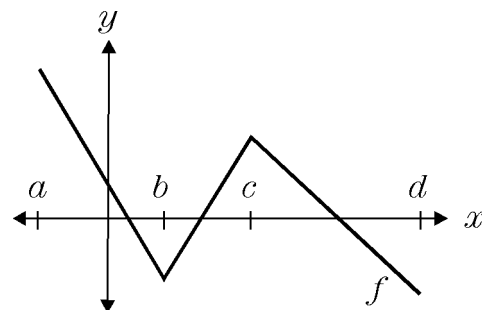
    A.   I only   B.   II only

    C.   I and II only   D.   I, II, and III

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1.
Answer: B

2.
Answer: D

3.
Answer: C

4.
Answer: C

5.
Answer: B

6.
Answer: B

7.
Answer: D

8.
Answer: A

9.
Answer: 15

10.
Answer: 3

11.
Answer: D

12.
Answer: A

13.
Answer: A

14.
Answer: A

15.
Answer: D

16.
Answer: A

17.
Answer: B

18.
Answer: C

19.
Answer: B

20.
Answer: C

21.
Answer: B

22.
Answer: A

23.
Answer: C

24.
Answer: A

25.
Answer: A

26.
Answer: B

27.
Answer: D

28.
Answer: A

29.
Answer: A

30.
Answer: C

31.
Answer: $-\frac{1}{4}$

32.
Answer: find an interval

33.
Answer: B