Limits and Continuity –
Past AP Questions

1. $\lim_{x\to\infty}\frac{4-x^2}{x^2-1}$
   a. 1
   b. 0
   c. -4
   d. -1
   e. ∞

2. $\lim_{x\to 0}\frac{\sin x}{x^2+3x}$
   a. 1
   b. 1/3
   c. 3
   d. ∞
   e. ¼

3. Suppose $\begin{cases} f(x)=\frac{3x^2-3x}{x^2-3x+2} \text{ for } x\neq 1,2 \\ f(1)=-3 \\ f(2)=4 \end{cases}$

   then f(x) is continuous
   a. Except at x = 1
   b. Except at x = 2
   c. Except at x = 1 or x = 2
   d. Except at x = 0, 1, 2
   e. At each real number

4. $\lim_{x\to 0}\frac{|x|}{x}$
   a. 0
   b. Does not exist
   c. 1
   d. -1
   e. None of these

5. Let $f(x)=\begin{cases} \frac{x^2-1}{x-1} \text{ if } x\neq 1 \\ 4 \text{ if } x=1 \end{cases}$

   Which of the following statements are true?
   I. $\lim_{x\to 1} f(x)$ exists
   II. $f(1)$ exists
   III. f is continuous at x = 1

   a. I only
   b. II only
   c. I and II
   d. none of them
   e. all of them

6. $f(x)=\begin{cases} 6+cx;\ x<1 \\ 9+2\ln x;\ x\geq 1 \end{cases}$

   If f is continuous at 1, what it the value of c?
   a. 2
   b. 3
   c. 5
   d. 9

7. If $\begin{cases} f(x)=\frac{x^2-x}{2x} \text{ for } x\neq 0 \\ f(0)=k \end{cases}$

   and if is continuous at x = 0, then k =
   a. -1
   b. -1/2
   c. 0
   d. ½
   e. 1

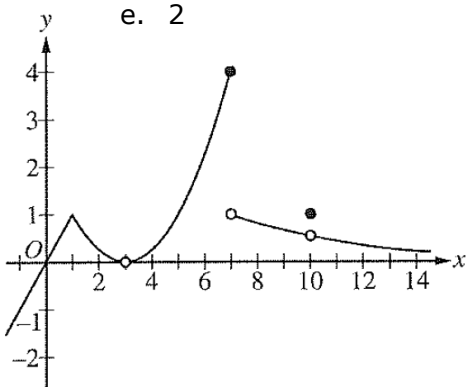
8. $\lim_{x\to -\infty}\frac{5x^3+27}{20x^2+10x+9}$
   a. $-\infty$
   b. -1
   c. 0
   d. 3
   e. ∞

9. The graph of $y=\frac{2x^2+2x+3}{4x^2-4x}$ has
   a. A horizontal asymptote at $y=\frac{\pm 1}{2}$ but no vertical asymptote
   b. No horizontal asymptote, but 2 vertical asymptotes at x= 0 and x = 1.
   c. A horizontal asymptote at y = ½ and 2 vertical asymptotes at x = 0 and x= 1.
   d. A horizontal asymptote at x = 2 but no vertical asymptote
   e. A horizontal asymptote at y = ½ and 2 vertical asymptotes at $x=\pm 1$

10. $\lim_{x\to 6^-}\frac{1}{(x-6)^2}=$
    a. -1
    b. $-\infty$
    c. 0
    d. ∞
    e. Does Not Exist

11. $\lim_{x \to -2} \frac{1}{x+2}$

a. Does Not Exist
b. $-\infty$
c. ∞
d. ½
e. 2



12. In the graph of f above, for what value of x is there a jump discontinuity?

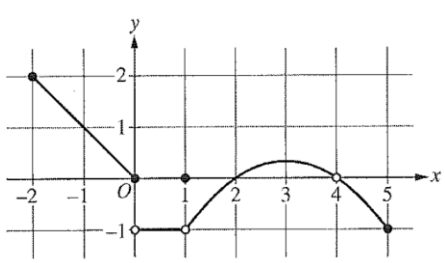
a. 1
b. 3
c. 7
d. 10

13. $\lim_{x \to 0} \frac{\sin 5x}{x}$

a. 0
b. 1/5
c. 1
d. 5
e. Does not exist

14. The graph of $y = \frac{x^2 - 9}{3x - 9}$ has

a. a vertical asymptote at x = 3.
b. a horizontal asymptote at y=1/3.
c. a removable discontinuity at x = 3.
d. an infinite discontinuity at x =3.
e. None of these



15. For the graph of f above, what values of a is $\lim_{x \to a} f(x) = 0$?

a. 2 only
b. 2 and 4
c. 0 and 2 only
d. 0,1 and 2
e. Nonexistent

16. If $a \neq 0$, then $\lim_{x \to a} \frac{x^2 - a^2}{x^4 - a^4}$ is

a. $\frac{1}{a^2}$
b. $\frac{1}{2a^2}$
c. $\frac{1}{6a^2}$
d. 0

17. $\lim_{x \to 4^-} \frac{|x-4|}{x-4}$

a. -1
b. 1
c. $-\infty$
d. $+\infty$
e. Nonexistent

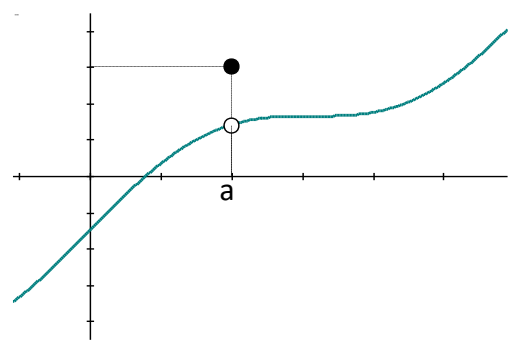
18.

x	0	1	2
f(x)	1	k	2

The function f is continuous on a closed interval [0,2] and has values that are given in the table above. The equation f(x) = ½ must have at least two solutions in the interval [0,2] if k =

a. 0
b. ½
c. 1
d. 2
e. 3

19.



The graph of a function f is shown above. Which of the following statement about f is false?

a. f is continuous at x = a.
b. f has a relative maximum at x = a.
c. x = a is in the domain of f.
d. $\lim_{x \to a^+} f(x)$ is equal to $\lim_{x \to a^-} f(x)$
e. $\lim_{x \to a} f(x)$ exists

20. Let f be the function given by $f(x)=\frac{(x-1)(x^2-4)}{x^2-a^2}$. For what positive values of a is f continuous for all real numbers x?

a. None
b. 1 only
c. 2 only
d. 4 only
e. 1 and 4 only

21. $\lim_{x\to\frac{\pi}{6}} \sec^2 x$

a. $\frac{3}{4}$
b. $\frac{\sqrt{3}}{2}$
c. $\frac{4}{3}$
d. $\frac{2\sqrt{3}}{3}$

22. If $f(x)=\begin{cases} x^2+3; & x\neq 1 \\ 1, & x=1 \end{cases}$, then $\lim_{x\to 1} f(x)=$

a. 1
b. 2
c. 3
d. 4

23. $\lim_{x\to 1^+} \frac{|x-1|}{1-x}=$

a. -2
b. -1
c. 1
d. DNE

24. $\lim_{x\to\infty} \frac{(1-2x^2)^3}{(x^2+1)^3}=$

a. 8
b. 1
c. 0
d. $-\infty$
e. $+\infty$
f. -8

25. If $f(x)=\begin{cases} \frac{\sqrt{3x-1}-\sqrt{2x}}{x-1}; & x\neq 1 \\ a; & x=1 \end{cases}$ is continuous at x = 1, then a = ?

a. ¼
b. $\frac{\sqrt{2}}{4}$
c. $\sqrt{2}$
d. 2

26. If $f(x)=\begin{cases} x+1; & x\leq 1 \\ 3+ax^2; & x>1 \end{cases}$, then f(x) is continuous for all x if a = ?

a. 1
b. -1
c. ½
d. 0
e. -2

27. The function $f(x)=\begin{cases} \frac{x^2}{x} & (x\neq 0) \\ 0 & (x=0) \end{cases}$

a. Is continuous everywhere
b. Is continuous except at x = 0
c. Has a removable discontinuity at x = 0
d. Has a infinite discontinuity at x = 0
e. Has x = 0 as a vertical asymptote

28. $\lim_{x\to\infty} \sqrt[3]{\frac{8+x^2}{x(x+1)}}=$

a. 0
b. 2
c. $\sqrt[3]{9}$
d. 1
e. DNE

Answers

1. D
2. B
3. B
4. B
5. C
6. B
7. B
8. A
9. C
10. D
11. A
12. C
13. D
14. C
15. B
16. B
17. A
18. A
19. A
20. A
21. C
22. D
23. B
24. F
25. B
26. B
27. A
28. D