



MATHS

BOOKS - PEARSON IIT JEE FOUNDATION

LIMITS

Example

1. Evaluate $\lim_{x \rightarrow 2} \left[\frac{x^2 - 5x + 6}{x^2 - 3x + 2} \right]$.



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2. Evaluate $\lim_{x \rightarrow 0} \left[\frac{x}{1 - \sqrt{1 - x}} \right]$.



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3. Evaluate $\lim_{x \rightarrow 3} \frac{(3 - \sqrt{6 + x})}{x - 3}$.



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4. Evaluate $\lim_{x \rightarrow 0} \frac{\sqrt{4 + x} - \sqrt{4 - x}}{\sqrt{9 + x} - \sqrt{9 - x}}$.



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5. Evaluate $\lim_{x \rightarrow 4} \left[\frac{x^4 - 256}{x - 4} \right]$.



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6. Evaluate $\lim_{x \rightarrow 3} \left[\frac{x^5 - 243}{x^2 - 9} \right]$.



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7. If $\lim_{x \rightarrow 2} \left[\frac{x^n - 2^n}{x - 2} \right] = 32$, then find the value of

n.



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8. Evaluate $\lim_{x \rightarrow \infty} \frac{2x + 3}{x - 5}$.



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9. Evaluate $\lim_{x \rightarrow \infty} \frac{3x^2 + 4x + 5}{4x^2 + 7}$.



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Very Short Answer Type Questions

1. When the number of sides of a polygon tends to infinity, it approaches _____.



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2. The scientists who put calculus in mathematical form are _____ and _____.



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3. The radius of circle tends to zero then it approaches a _____.



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4. _____ helps in finding the areas of the curves.



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5. Evaluate $\lim_{x \rightarrow 2} (2x - 2)$.



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6. The limiting position of a secant is _____.



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7. $\lim_{x \rightarrow a} x^n + ax^{n-1} + a^2x^{n-2} + \dots + a^n =$
_____.



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8. $\lim_{x \rightarrow 3} \log(4x - 11) =$ _____.



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9. A circle is inscribed in a polygon. As the number of sides increases, the difference in areas of circle and polygon _____.



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$$10. \lim_{x \rightarrow 0} \frac{x^2 + 8x}{x} = \text{-----}.$$

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$$11. \lim_{n \rightarrow \infty} \frac{n(n + 1)}{n^2} = \text{-----}.$$

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$$12. \lim_{n \rightarrow \infty} \frac{1}{n} = \text{-----}.$$

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13. $\lim_{x \rightarrow 1} \frac{\sqrt[5]{x} - 1}{\sqrt[4]{x} - 1} = \text{-----}$.



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14. $\lim_{x \rightarrow -a} \frac{x^n + a^n}{x + a}$ (where n is an odd natural number)



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15. $\lim_{x \rightarrow 0^-} \frac{|x|}{x} = \text{-----}$.



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16. $\lim_{x \rightarrow 3} \sqrt{9 - x^2} = \underline{\hspace{2cm}}$.

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17. Evaluate: $\lim_{x \rightarrow 3} \frac{|x - 3|}{x - 3}$.

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18. Evaluate: $\lim_{x \rightarrow a} \left[\frac{x^n - a^n}{x^m - a^m} \right]$.

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19. $\lim_{x \rightarrow 5} \frac{\sqrt{x} - \sqrt{5}}{x - 5} = \text{-----}$.



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20. If $\lim_{x \rightarrow 0} \left[\frac{2x^2 + 3x + b}{x^2 + 4x + 3} \right] = 2$, then the value of b is _____.



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21. What is the value of

$$\lim_{x \rightarrow 1} (x^3 + 1)(x^2 - 2x + 4)?$$



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22. Evaluate: $\lim_{x \rightarrow 3} \left[\frac{x^3 - 27}{x - 3} \right]$.

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23. Evaluate: $\lim_{x \rightarrow \infty} \left[\frac{x^2 + x + 6}{x + 1} \right]$.

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24. Evaluate: $\lim_{x \rightarrow \infty} \left[\frac{4x^n + 1}{5x^n + 5} \right]$.

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25. Evaluate: $\lim_{x \rightarrow a} \frac{x^{1/4} - a^{1/4}}{x^4 - a^4}$.

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26. Evaluate: $\lim_{x \rightarrow -2} \frac{x^7 + 128}{x + 2}$.

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27. Evaluate: $\lim_{x \rightarrow 1} \left[\frac{x^2 + 3x + 2}{x^2 - 5x + 3} \right]$.

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28. Evaluate: $\lim_{x \rightarrow 5} \sqrt{25 - x^2}$.



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29. In finding $\lim_{x \rightarrow a} f(x)$, we replace x by $\frac{1}{n}$, then the limit becomes _____.



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30. $\lim_{x \rightarrow \infty} \frac{7x - 3}{8x - 10} = \text{-----}$.



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Short Answer Type Questions

1. Evaluate: $\lim_{x \rightarrow \infty} \frac{11|x| + 7}{8|x| - 9}$.



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2. Evaluate: $\lim_{x \rightarrow 2} \left[\frac{2x^2 - 9x + 10}{5x^2 - 5x - 10} \right]$.



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3. Evaluate: $\lim_{x \rightarrow 3} \frac{x^5 - 243}{x - 3}$.



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4.

Evaluate:

$$\lim_{x \rightarrow \infty} \frac{x^5 + 3x^4 - 4x^3 - 3x^2 + 2x + 1}{2x^5 + 4x^2 - 9x + 16}.$$



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5. Evaluate: $\lim_{x \rightarrow a} \frac{x^{14} - a^{14}}{x^{-7} - a^{-7}}.$



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6. Evaluate: $\lim_{x \rightarrow 2} \frac{x - 2}{\sqrt{x + 2} - 2}.$



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7. Evaluate: $\lim_{x \rightarrow 0} \frac{\sqrt{5+x} - \sqrt{5-x}}{\sqrt{10+x} - \sqrt{10-x}}$.

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8. Evaluate: $\frac{\lim_{x \rightarrow 0} \frac{\sqrt{1+x+x^2+x^3} - 1}{x}}$.

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9. $\lim_{x \rightarrow \infty} \frac{x^n + a^n}{x^n - a^n} = \text{-----}$.

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10. Evaluate: $\lim_{x \rightarrow 1} \left[\frac{x^4 - 2x^3 - x^2 + 2x}{x - 1} \right]$.

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11. Evaluate: $\lim_{x \rightarrow a} \frac{\sqrt{x+a} - \sqrt{2a}}{x-a}$.

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12. Evaluate: $\lim_{n \rightarrow \infty} \left(\sum_{r=0}^n \frac{1}{2^r} \right)$.

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13. If $\lim_{x \rightarrow -3} \frac{x^k + 3^k}{x + 3} = 405$, where k is an odd natural number then, $k =$ _____.



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14. $\lim_{x \rightarrow 4^-} \frac{|x - 4|}{x - 4} =$ _____.



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15. $\lim_{x \rightarrow 3} \frac{\log(2x - 3) - \log(3x + 2)}{\log(2x + 1)} =$ _____.



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Essa Type Questions

1. Evaluate: $\lim_{n \rightarrow \infty} \frac{n(1 + 4 + 9 + 16 + \dots + n^2)}{n^4 + 8n^3}$



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2. Evaluate: $\lim_{n \rightarrow \infty} \frac{n^2(1 + 2 + 3 + 4 + \dots + n)}{n^4 + 4n^2}$.



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3. $\lim_{x \rightarrow 1} \frac{\sqrt{x+1} - \sqrt{5x-3}}{\sqrt{2x+3} - \sqrt{4x+1}} = \text{_____}$.

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$$4. \lim_{n \rightarrow \infty} \frac{1 + 3 + 5 + 7 + \dots \text{ n terms}}{2 + 4 + 6 + 8 + \dots \text{ n terms}} = \text{-----}.$$

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$$5. \lim_{x \rightarrow 3} \left[\frac{2}{x - 3} + \frac{2}{x^2 - 7x + 12} \right] = \text{-----}.$$

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Level 1

1. Evaluate: $\lim_{x \rightarrow 3} (4x^2 + 3) = \underline{\hspace{2cm}}$.

A. 36

B. 39

C. 40

D. None of these

Answer: B



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2. $\lim_{x \rightarrow \infty} \frac{2x + 4}{x - 2} = \underline{\hspace{2cm}}$.

A. 1

B. 0

C. 2

D. 6

Answer: C



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3. $\lim_{x \rightarrow 5^+} \frac{|x - 5|}{x - 5} = \text{-----}.$

A. 1

B. -1

C. 0

D. Cannot be determined

Answer: A



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4. Evaluate: $\lim_{x \rightarrow 1} \frac{2x^2 + 4x + 4}{2x - 1}$.

A. 1

B. 10

C. 20

D. 5

Answer: B



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5. Evaluate: $\lim_{x \rightarrow 20} \frac{\sqrt{x+5} + 5}{\sqrt{x+5} - 5}$.

A. 1

B. 2

C. 4

D. ∞

Answer: D



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6. $\lim_{x \rightarrow 0} \frac{\sqrt{8 - 3x} + \sqrt{8 + 4x}}{\sqrt{2 - 3x}} = \text{-----}$.

A. 5

B. 3

C. 2

D. 4

Answer: D



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7. $\lim_{x \rightarrow \infty} \frac{(x - 1)(2x - 1)}{(x - 4)(x - 7)} = \text{-----}$.

A. 0

B. 1

C. 2

D. -1

Answer: C



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8. $\lim_{x \rightarrow 2} \frac{x^{-8} - \frac{1}{256}}{x - 2} = \text{-----}$.

A. $-\frac{1}{32}$

B. $-\frac{1}{128}$

C. $-\frac{1}{256}$

D. $-\frac{1}{64}$

Answer: D



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9. $\lim_{x \rightarrow 2} \frac{x^2 + 2x - 8}{2x^2 - 3x - 2} = \text{-----}$.

A. $\frac{1}{5}$

B. $\frac{6}{5}$

C. $\frac{3}{2}$

D. $-\frac{1}{6}$

Answer: B



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10. $\lim_{x \rightarrow 4^-} \sqrt{16 - x^2}$ is a/an

A. complex number.

B. real number.

C. natural number.

D. integer.

Answer: B



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11. $\lim_{x \rightarrow 0} \log\left(\frac{2x + 1}{5x + 4}\right) = \text{-----}$.

A. $-2 \log 2$

B. $\log 4$

C. $\log\left(\frac{1}{2}\right)$

D. $-3 \log 2$

Answer: A



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12. $\lim_{x \rightarrow 3} \frac{\sqrt{x+3} + \sqrt{x+6}}{\sqrt{x+1} - 2} = \text{-----}$.

A. 1

B. 7

C. 14

D. None of these

Answer: D



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13. $\lim_{x \rightarrow 5} \frac{\sqrt{x + 20} - \sqrt{3x + 10}}{5 - x} = \underline{\hspace{2cm}}$.

A. $-\frac{2}{5}$

B. $\frac{2}{5}$

C. $\frac{1}{5}$

D. $\frac{-1}{5}$

Answer: C



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14. $\lim_{x \rightarrow -3} \frac{x^2 - 2x - 15}{x^2 + 2x - 3} = \underline{\hspace{2cm}}$.

A. 1

B. 2

C. -3

D. -4

Answer: B



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15. $\lim_{x \rightarrow \infty} \frac{(x - 5)(x + 7)}{(x + 2)(5x + 1)} = \text{-----}$.

A. $-\frac{1}{5}$

B. 25

C. 5

D. $\frac{1}{5}$

Answer: D



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16.

Evaluate:

$$\lim_{x \rightarrow 2} \frac{f(x) - f(2)}{x - 2}, \text{ where } f(x) = x^2 - 4x$$

A. -1

B. 2

C. 0

D. 4

Answer: C



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17. Evaluate: $\lim_{x \rightarrow 9} \frac{2x - 7\sqrt{x} + 3}{3x - 11\sqrt{x} + 6}$.

A. $\frac{3}{4}$

B. $\frac{5}{3}$

C. $\frac{5}{7}$

D. $\frac{3}{7}$

Answer: C



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18. $\lim_{x \rightarrow b} \frac{\sqrt{x} - \sqrt{b}}{x - b} = \text{-----}$.

A. $\frac{1}{2b}$

B. $\frac{\sqrt{2}}{b}$

C. $\frac{1}{2\sqrt{b}}$

D. $\frac{1}{\sqrt{2}b}$

Answer: C



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19. $\lim_{x \rightarrow 3} \frac{x - 3}{\sqrt{x + 6} - \sqrt{2x + 3}} = \text{-----}$.

A. -5

B. -6

C. 9

D. 6

Answer: B



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20. $\lim_{x \rightarrow -2} \frac{x + 2}{\sqrt{2x + 8} - \sqrt{2 - x}} = \text{-----}$.

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

B. $\frac{2}{3}$

C. 1

D. $\frac{4}{3}$

Answer: D



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21. Evaluate: $\lim_{x \rightarrow 1} \left[\frac{\log x^3 + \log\left(\frac{1}{x^2}\right) + \log 2}{\log(x^3 + 3)} \right]$

A. $\frac{3}{2}$

B. 1

C. $\frac{1}{2}$

D. 2

Answer: C



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22. $\lim_{x \rightarrow 3} \frac{x^{-5} - \frac{1}{243}}{x - 3} = \text{-----}$.

A. $-\frac{5}{729}$

B. $-\frac{5}{243}$

C. $\frac{5}{81}$

D. $\frac{5}{729}$

Answer: A



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23. $\lim_{x \rightarrow \infty} \frac{4x - 3}{(2x + 3)} = \text{-----}$.

A. 0

B. 1

C. $\frac{1}{2}$

D. 2

Answer: D



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24. Evaluate: $\lim_{d \rightarrow 3} \frac{d^3 - 27}{d - 3}$.

A. 3

B. 9

C. 27

D. 6

Answer: C



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25. $\lim_{x \rightarrow 3^-} \sqrt{9 - x^2}$ is a/an

- A. natural number.
- B. real number.
- C. imaginary number.
- D. integer.

Answer: B



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26. Evaluate: $\lim_{x \rightarrow 4} \frac{3x - 8\sqrt{x} + 4}{5x - 9\sqrt{x} - 2}$.

A. $\frac{1}{5}$

B. $\frac{4}{11}$

C. $\frac{3}{10}$

D. 5

Answer: B



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27. For some real number k , the value of

$$\lim_{x \rightarrow -k} \frac{x^5 + k^5}{x + k} \text{ can be } \underline{\hspace{2cm}}.$$

A. 50

B. 60

C. 70

D. 80

Answer: D



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28.

Evaluate:

$$\lim_{x \rightarrow 1} \frac{f(x) - f(1)}{x - 1}, \text{ where } f(x) = x^2 - 2x.$$

A. -1

B. 0

C. 1

D. 2

Answer: B



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29. Evaluate: $\lim_{x \rightarrow a} \frac{x^{1/5} - a^{1/5}}{x^{-4/5} - a^{-4/5}}$.

A. $\frac{-a}{4}$

B. $\frac{-1}{4a}$

C. $\frac{1}{4a}$

D. $\frac{a}{4}$

Answer: A



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30. $\lim_{x \rightarrow \infty} \frac{6x^4 + 7x^3 + 2x + 1}{x^4 + 1} = \underline{\hspace{2cm}}$.

A. 1

B. 2

C. 3

D. 6

Answer: D



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Level 2

1. Evaluate: $\lim_{x \rightarrow -2} \frac{2x^3 - x^2 - 13x - 6}{3x^2 + x - 10}$.

A. $-\frac{5}{7}$

B. $-\frac{17}{5}$

C. $-\frac{15}{11}$

D. $-\frac{10}{3}$

Answer: C



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2. Evaluate: $\lim_{x \rightarrow -1} \frac{\log x^2 - \log\left(\frac{1}{x^4}\right) + \log 3}{\log\left(\frac{x^3}{-3}\right)}$.

A. 1

B. 0

C. -1

D. Does not exist

Answer: C



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3. $\lim_{x \rightarrow \infty} \left\{ \left(\frac{3x}{\sqrt{x^2 + 5x - 6} + 2x} \right) \right\} = \text{_____}.$

A. -1

B. 1

C. 0

D. ∞

Answer: B



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4. $\lim_{x \rightarrow \infty} \frac{(4x + 5)(2x - 1)}{(27x^2 + 1)} = \text{_____}$.

A. $\frac{4}{27}$

B. $\frac{8}{27}$

C. $\frac{2}{27}$

D. $\frac{6}{27}$

Answer: B



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5. $\lim_{x \rightarrow 1} \frac{x^3 - 6x^2 + 11x - 6}{x^2 - 5x + 4} = \text{-----}$.

A. $\frac{2}{3}$

B. $-\frac{5}{3}$

C. $\frac{5}{3}$

D. $\frac{-2}{3}$

Answer: D



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6. If $\lim_{x \rightarrow a} \frac{x^5 - a^5}{x - a} = 5$, then find the sum of the possible real value of a.

A. 0

B. 2

C. 3

D. 5

Answer: A



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$$7. \lim_{x \rightarrow 0} \frac{x}{\sqrt{3+x} - \sqrt{3-x}} = \text{-----}.$$

A. $\sqrt{3}$

B. $\sqrt{-3}$

C. $2\sqrt{3}$

D. $-2\sqrt{3}$

Answer: A



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$$8. \lim_{x \rightarrow 1} \frac{4 - \sqrt{15+x}}{1-x} = \text{-----}.$$

A. $\frac{1}{6}$

B. $\frac{1}{8}$

C. $\frac{1}{10}$

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

Answer: B



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9. $\lim_{x \rightarrow 0} \frac{\sqrt{1 + x + x^2 + x^3} - 1}{x} = \underline{\hspace{2cm}}$.

A. 1

B. 2

C. $\frac{1}{2}$

D. $\frac{1}{4}$

Answer: C



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10. $\lim_{x \rightarrow 0} \frac{\sqrt[4]{x + 16} - 2}{x} = \text{-----}$.

A. $\frac{1}{16}$

B. $\frac{1}{8}$

C. $\frac{1}{32}$

D. $\frac{1}{20}$

Answer: C



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11.

$$\lim_{x \rightarrow \infty} \frac{(x+2)^{10} + (x+4)^{10} + \dots + (x+20)^{10}}{x^{10} + 1} =$$

_____.

A. 12

B. 20

C. 40

D. 10

Answer: D



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12. $\lim_{n \rightarrow \infty} \frac{2 + 6 + 10 + 14 + \dots 2n \text{ terms}}{2 + 4 + 6 + 8 + \dots n \text{ terms}} = \text{-----}$.

A. 4

B. 16

C. 8

D. 10

Answer: C



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13.

Evaluate:

$$\lim_{x \rightarrow -a} \frac{1}{x} \left[\frac{1}{x+a} + \frac{b+a}{x^2 - bx + ax - ab} \right] =$$

_____.

A. $\frac{1}{a}$

B. $\frac{1}{a+b}$

C. $\frac{1}{a(a+b)}$

D. $\frac{1}{a(a-b)}$

Answer: C



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$$14. \lim_{x \rightarrow 5} \frac{\sqrt{2x-3} - \sqrt{3x-8}}{\sqrt{2x-1} - \sqrt{3x-6}} = \text{-----}.$$

A. $\frac{2\sqrt{7}}{3}$

B. $\frac{3}{2\sqrt{7}}$

C. $\frac{4}{3}\sqrt{7}$

D. $\frac{3}{\sqrt{7}}$

Answer: D



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15. If $\lim_{x \rightarrow a} \frac{x^7 - a^7}{x - a} = 7$, then find the number of possible real values of a .

A. 0

B. 1

C. 2

D. 7

Answer: C



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$$1. \lim_{n \rightarrow \infty} \frac{1 + 4 + 9 + 16 + \dots + n^2}{4n^3 + 1} = \text{-----}.$$

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

B. $\frac{1}{24}$

C. $\frac{1}{8}$

D. $\frac{1}{16}$

Answer: A



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$$2. \lim_{x \rightarrow 0} \frac{\sqrt[5]{x + 32} - 2}{x} = \text{-----}.$$

A. $\frac{1}{16}$

B. $\frac{1}{45}$

C. $\frac{1}{80}$

D. $\frac{1}{100}$

Answer: C



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3. $\lim_{x \rightarrow 2} \frac{\sqrt{x^3 - 2x^2 + 2x - 3} - 1}{x - 2} = \underline{\hspace{2cm}}$.

A. 4

B. 8

C. 6

D. 3

Answer: D



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4.

Evaluate:

$$\lim_{n \rightarrow \infty} \frac{(1^2 + 2^2 + 3^2 + \dots + n^2)}{(1 + 3 + 5 + 7 + \dots + n \text{ terms})}$$

A. 0

B. 1

C. ∞

D. Does not exist

Answer: A



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5. Evaluate: $\lim_{x \rightarrow 0} \frac{\sqrt{6+x} - \sqrt{6-x}}{\sqrt{8+x} - \sqrt{8-x}}$.

A. $\sqrt{3}$

B. $\frac{-5\sqrt{3}}{3}$

C. $\frac{4\sqrt{3}}{3}$

D. $\frac{2\sqrt{3}}{3}$

Answer: D



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6. Evaluate: $\lim_{\theta \rightarrow 0} \cot\theta - \operatorname{cosec}\theta.$

A. 0

B. 2

C. 4

D. None of these

Answer: A



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7.

$$\lim_{x \rightarrow \infty} \frac{(x+1)^{100} + (x+2)^{100} + \dots + (x+50)^{100}}{x^{100} + x^{99} + \dots + x + 1} =$$

-----.

A. 100

B. 1

C. 21

D. 50

Answer: D



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8. $\lim_{x \rightarrow 3^-} \frac{|2x - 6|}{2x - 6}$ is _____.

A. 1

B. -1

C. 0

D. ∞

Answer: B



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9. If $\lim_{x \rightarrow -2} \frac{x^p + 2^p}{x + 2} = 80$ (where p is an odd number), then p can be _____.

A. 3

B. 5

C. 7

D. 9

Answer: B



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10. If $\lim_{x \rightarrow m} \frac{x^3 - m^3}{x - m} = 3$, then find the number of possible values of m .

A. 0

B. 2

C. 1

D. 3

Answer: B



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11. $\lim_{x \rightarrow 3} \frac{\sqrt{5x + 1} - \sqrt{7x - 5}}{\sqrt{7x + 4} - \sqrt{5x + 10}} = \text{-----}$.

A. 0

B. $-\frac{5}{4}$

C. $\frac{5}{4}$

D. ∞

Answer: B



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12.

$$\lim_{x \rightarrow a} (x - a) \left(\frac{1}{x - a} - \frac{1}{x^2 - (a + b)x + ab} \right) =$$

_____.

A. $\frac{a - b - 1}{a - b}$

B. 0

C. 1

D. $\frac{a + b}{a - b}$

Answer: A



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13. $\lim_{x \rightarrow \frac{2}{5}} \frac{1}{|5x - 2|} = \text{-----}$.

A. 0

B. ∞

C. 1

D. Does not exist

Answer: B



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14. $\lim_{x \rightarrow \infty} \frac{5x^2}{\sqrt{25x^4 + 13x^3 + 14x^2 + 17x + 6}}$ is _____.

A. 1

B. $\frac{1}{5}$

C. $\frac{5}{14}$

D. None of these

Answer: A



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15. $\lim_{x \rightarrow -1} \frac{x^5 + 1}{x + 1} = \text{_____}$.

A. 1

B. -5

C. 5

D. None of these

Answer: C



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