



MATHS

BOOKS - RS AGGARWAL MATHS (HINGLISH)

LIMIT

Example

1. Evaluate (i) $\lim_{x \rightarrow 3} \left(\frac{x^2 - 9}{x - 3} \right)$ (ii) $\lim_{x \rightarrow 1} \frac{(x^2 - 4x + 3)}{(x - 1)}$.

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

A. 1

B. 2

C. 0

D. 4

Answer: A



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Solved Examples

1. Evaluate $\lim_{x \rightarrow a} \left\{ \frac{x^{12} - a^{12}}{x - a} \right\}$.

A. $12a$

B. a^{11}

C. $12a^{11}$

D. none of these

Answer: C



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2. $\lim_{x \rightarrow 2} \left(\frac{x^5 - 32}{x^3 - 8} \right)$



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3. Evaluate $\lim_{x \rightarrow 1} \frac{x^{15} - 1}{x^{10} - 1}$



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4. Evaluate $\lim_{x \rightarrow a} \left(\frac{x^m - a^m}{x^n - a^n} \right)$.



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5. Evaluate $\lim_{x \rightarrow a} \frac{(x + 2)^{3/2} - (a + 2)^{3/2}}{x - a}$.



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6. Evaluate $\lim_{x \rightarrow 0} \frac{(1+x)^n - 1}{x}$

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7. Evaluate $\lim_{x \rightarrow 1} \left(\frac{1 - x^{-1/3}}{1 - x^{-2/3}} \right)$.

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8. Evaluate $\lim_{x \rightarrow 0} \frac{(\sqrt{1+3x} - \sqrt{1-3x})}{x}$.

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

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10. Evaluate $\lim_{x \rightarrow 0} \left(\frac{e^{3x} - 1}{x} \right)$.

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11. Evaluate $\lim_{x \rightarrow 2} \left(\frac{e^x - e^2}{x - 2} \right)$.

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12.

Evaluate:

(i) $\lim_{x \rightarrow 0} \left(\frac{e^{-x} - 1}{x} \right)$ (ii) $\lim_{x \rightarrow 0} \left(\frac{e^x - e^{-x}}{x} \right)$ (iii) $\lim_{x \rightarrow 0} \left(\frac{e^x + e^{-x} - 2}{x^2} \right)$

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13. Evaluate $\lim_{x \rightarrow 0} \left(\frac{3^x - 2^x}{x} \right)$.

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14. Evaluate $\lim_{x \rightarrow 0} \left(\frac{3^x - 2^{3x}}{x} \right)$.

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15. Evaluate $\lim_{x \rightarrow 0} \left(\frac{3^{2x} - 1}{2^{3x} - 1} \right)$.

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16. Evaluate $\lim_{x \rightarrow 1} \frac{x^2 - \sqrt{x}}{\sqrt{x} - 1}$.

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17. Evaluate: $(\lim)_{x \rightarrow a} \frac{\sqrt{a+2x} - \sqrt{3x}}{\sqrt{3a+x} - 2\sqrt{x}}, (a \neq 0)$.

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18. $\lim_{x \rightarrow 1} \frac{(2x - 3)(\sqrt{x} - 1)}{2x^2 + x - 3}$



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19. Evaluate $\lim_{x \rightarrow 0} \frac{(1 + x)^4 - 1}{x}$.



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20. Evaluate $\lim_{x \rightarrow 0} \frac{(1 + x)^6 - 1}{(1 + x)^5 - 1}$.



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21. Evaluate: (i) $\lim_{x \rightarrow 0} \frac{\sin 2x}{x}$ (ii) $\lim_{x \rightarrow 0} \frac{\sin 3x}{5x}$ (iii) $\lim_{x \rightarrow 0} \left(\frac{\sin ax}{\sin bx} \right)$



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$$22. \lim_{x \rightarrow 0} \frac{\sin 5x}{\tan 3x}$$



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$$23. \text{Evaluate } \lim_{x \rightarrow 0} \frac{(1 - \cos x)}{x^2}.$$



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$$24. \text{Evaluate (i) } \lim_{x \rightarrow 0} \left(\frac{1 - \cos 4x}{1 - \cos 5x} \right)$$

$$(ii) \lim_{x \rightarrow 0} \left(\frac{1 - \cos mx}{1 - \cos nx} \right).$$



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$$25. \lim_{x \rightarrow 0} \frac{\sin 2x + \sin 6x}{\sin 5x - \sin 3x}$$



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26. Evaluate $\lim_{x \rightarrow \pi} \left(\frac{1 + \cos x}{\tan^2 x} \right)$.



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27. Evaluate $\lim_{x \rightarrow 0} \frac{x \tan x}{1 - \cos x}$



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28.

Evaluate:

(i) $\lim_{x \rightarrow \frac{\pi}{2}} (\sec x - \tan x)$ (ii) $\lim_{x \rightarrow 0} \frac{(\cos ex - \cot x)}{x}$



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29. Evaluate: (i) $\lim_{x \rightarrow 0} \left(\frac{\tan x - \sin x}{\sin^3 x} \right)$ (ii) $\lim_{x \rightarrow 0} \frac{(\tan x - \sin x)}{x^3}$



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30. Evaluate $\lim_{x \rightarrow 0} \left(\frac{x^3 \cot x}{1 - \cos x} \right)$.

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31. $\lim_{x \rightarrow 0} \frac{\sin 3x + 7x}{4x + \sin 2x}$

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32. Evaluate $\lim_{x \rightarrow 0} \frac{\tan 3x - 2x}{3x - \sin^2 x}$

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33. Evaluate $\lim_{x \rightarrow 0} \frac{x \tan 4x}{1 - \cos 4x}$.

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34. Evaluate $\lim_{x \rightarrow 0} \frac{(1 - \cos x \sqrt{\cos 2x})}{x^2}$.



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35. Evaluate $\lim_{x \rightarrow \frac{\pi}{4}} \frac{(\sin x - \cos x)}{\left(x - \frac{\pi}{4}\right)}$.



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36. Evaluate $\lim_{x \rightarrow \frac{\pi}{2}} \frac{\cos x}{\left(\frac{\pi}{2} - x\right)}$.



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37. Evaluate $\lim_{x \rightarrow \frac{\pi}{6}} \frac{(\sqrt{3} \sin x - \cos x)}{\left(x - \frac{\pi}{6}\right)}$.



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38. Let $f(x) \begin{cases} 2x + 3, & x \leq 0 \\ 3(x + 1), & x > 0. \end{cases}$

Find (i) $\lim_{x \rightarrow 0} f(x)$ (ii) $\lim_{x \rightarrow 1} f(x)$

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39. Let $f(x) = \begin{cases} x^2 - 1, & x \leq 1 \\ -x^2 - 1, & x > 1. \end{cases}$ Find $\lim_{x \rightarrow 1} f(x)$.

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40. Let $f(x) = \begin{cases} \frac{|x|}{x}, & x \neq 0 \\ 0, & x = 0. \end{cases}$

Find $\lim_{x \rightarrow 0} f(x)$.

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41. Suppose $f(x) = \begin{cases} a + bx & x < 1 \\ 4 & x = 1 \\ b - ax & x > 1 \end{cases}$ and if $\lim_{x \rightarrow 1} f(x) = f(1)$, what

are the values of a and b ?

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42. If $f(x) = \begin{cases} |x| + 1 & x < 0 \\ 0 & x = 0 \\ |x| - 1 & x > 0 \end{cases}$

for what value (s) of a does $\lim_{x \rightarrow a} f(x)$ exist?

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43. Let $f(x) = \begin{cases} mx^2 + n, & x < 0 \\ nx + m, & 0 \leq x \leq 1 \\ nx^3 + m, & x > 1 \end{cases}$

For what values of integers m and n ,

$\lim_{x \rightarrow 0} f(x)$ and $\lim_{x \rightarrow 1} f(x)$ both exist?

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44. Let a_1, a_2, \dots, a_n be fixed real numbers and let

$$f(x) = (x - a_1)(x - a_2)(x - a_3)\dots(x - a_n).$$

Find $\lim_{x \rightarrow a_1} f(x)$.

If $a \neq a_1, a_2, \dots, a_n$, Compute $\lim_{x \rightarrow a} f(x)$.



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45. Let $f(x) = \{x\} =$ greater integer less than or equal to x . For any integer k , show that $\lim_{x \rightarrow k} f(x)$ does not exist.



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46. If f is an odd function and $\lim_{x \rightarrow 0} f(x)$ exists then prove that this limit must

be 0.



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47. If f is an even function, prove that $\lim_{x \rightarrow 0^-} f(x) = \lim_{x \rightarrow 0^+} f(x)$.



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48. Show that $\lim_{x \rightarrow 0^-} \left(\frac{e^{1/x} - 1}{e^{1/x} + 1} \right)$ does not exist.



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49. Show that $(\lim)_{x \rightarrow 0} \frac{x}{|x|}$ does not exist.



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Exercise 27 A

1. Evaluate the following limits:

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

A. 3

B. 2

C. 5

D. does not exist

Answer: A



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2. Evaluate the following limits:

$$\lim_{x \rightarrow 1} (6x^2 - 4x + 3)$$

A. 5

B. 4

C. 3

D. 2

Answer: A



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3. Evaluate the following limits:

$$\lim_{x \rightarrow 3} \left(\frac{x^2 + 9}{x + 3} \right)$$

A. 3

B. 1/6

C. 9

D. 6

Answer: A



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4. Evaluate the following limits:

$$\lim_{x \rightarrow 3} \left(\frac{x^2 - 4x}{x - 2} \right)$$

A. 3

B. -3

C. -1

D. 0

Answer: B



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5. Evaluate the following limits: $\lim_{x \rightarrow 5} \left(\frac{x^2 - 25}{x - 5} \right)$

A. 10

B. 20

C. 30

D. 40

Answer: A





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6. Evaluate the following limits: $\lim_{x \rightarrow 1} \left(\frac{x^3 - x}{x - 1} \right)$

A. 3

B. 2

C. -2

D. 0

Answer: B



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7. Evaluate the following limits: $\lim_{x \rightarrow -2} \left(\frac{x^3 + 8}{x + 2} \right)$

A. 11

B. 12

C. 13

D. 14

Answer: B

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8. Evaluate the following limits: $\lim_{x \rightarrow 3} \left(\frac{x^3 - 27}{x - 3} \right)$

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9. Evaluate the following limits: $\lim_{x \rightarrow 3} \left(\frac{x^2 - 4x + 3}{x^2 - 2x - 3} \right)$

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10. Evaluate the following limits:

$$\lim_{x \rightarrow \frac{1}{2}} \left(\frac{4x^2 - 1}{2x - 1} \right)$$

A. -1

B. 1

C. 2

D. 0

Answer: C



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11. Evaluate the following limits:

$$\lim_{x \rightarrow 4} \left(\frac{x^3 - 64}{x^2 - 16} \right)$$



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12. Evaluate the following limits:

$$\lim_{x \rightarrow 2} \left(\frac{x^5 - 32}{x^3 - 8} \right)$$



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13. Evaluate the following limits: $\lim_{x \rightarrow a} \left(\frac{x^{5/2} - a^{5/2}}{x - a} \right)$



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14. Evaluate the following limits:

$$\lim_{x \rightarrow a} \left\{ \frac{(x + 2)^{5/3} - (a + 2)^{5/3}}{x - a} \right\}$$



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15. Evaluate the following limits:

$$\lim_{x \rightarrow 1} \left(\frac{x^n - 1}{x - 1} \right)$$



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16. Evaluate the following limits:

$$\lim_{x \rightarrow a} \left(\frac{\sqrt{x} - \sqrt{a}}{x - a} \right).$$

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17. Evaluate the following limits: $\lim_{h \rightarrow 0} \left(\frac{\sqrt{1+h} - 1}{h} \right)$

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18. $\lim_{h \rightarrow 0} \frac{1}{h} \left(\frac{1}{\sqrt{x+h}} - \frac{1}{\sqrt{x}} \right)$

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19. Evaluate the following limits: $\lim_{x \rightarrow 0} \left(\frac{\sqrt{x+h} - \sqrt{x}}{x} \right)$

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20. Evaluate the following limits: $\lim_{x \rightarrow 0} \left(\frac{\sqrt{2-x} - \sqrt{2+x}}{x} \right)$



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21. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \left(\frac{\sqrt{1+x+x^2} - 1}{x} \right)$$



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22. Evaluate the following limits: $\lim_{x \rightarrow 1} \left(\frac{\sqrt{2-x} - 1}{1-x} \right)$



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23. Evaluate the following limits: $\lim_{x \rightarrow 0} \left(\frac{2x}{\sqrt{x+2} - \sqrt{2-x}} \right)$



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24. Evaluate the following limit: $\left(\lim \right)_{x \rightarrow 1} \frac{\sqrt{3+x} - \sqrt{5-x}}{x^2 - 1}$



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25. Evaluate the following limits:

$$\lim_{x \rightarrow 2} \left(\frac{x^2 - 4}{\sqrt{x+2} - \sqrt{3x-2}} \right)$$



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26. Evaluate the following limits: $\lim_{x \rightarrow 4} \left(\frac{3 - \sqrt{5+x}}{1 - \sqrt{5-x}} \right)$



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27. Evaluate the following limits:

$$\lim_{x \rightarrow 1} \left(\frac{\sqrt{a+x} - \sqrt{a}}{x\sqrt{x(a+x)}} \right)$$

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28. Evaluate the following limits: $\lim_{x \rightarrow 0} \left(\frac{\sqrt{1+x^2} - \sqrt{1+x}}{\sqrt{1+x^3} - \sqrt{1+x}} \right)$

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29. $\lim_{x \rightarrow 1} \left(\frac{x^4 - 3x^2 + 2}{x^3 - 5x^2 + 3x + 1} \right)$

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30. Evaluate the following limits:

$$\lim_{x \rightarrow 2} \left(\frac{3^x + 3^{3-x} - 12}{3^{3-x} - 3^{\frac{x}{2}}} \right)$$

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31. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \left(\frac{e^{4x} - 1}{x} \right)$$



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32. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \left(\frac{e^{2+x} - e^2}{x} \right)$$



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33. Evaluate the following limits:

$$\lim_{x \rightarrow 4} \left(\frac{e^x - e^4}{x - 4} \right)$$



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34. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \left(\frac{e^{2+x} - e^2}{x} \right)$$



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35. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \left(\frac{e^x - x - 1}{x} \right)$$



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36. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \left(\frac{e^{bx} - e^{ax}}{x} \right), 0 < a < b$$



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37. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \left(\frac{a^x - b^x}{x} \right)$$



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38. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \left(\frac{a^x - a^{-x}}{x} \right)$$



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39. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \left(\frac{2^x - 1}{x} \right)$$



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40. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \left(\frac{3^{2+x} - 9}{x} \right)$$



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Exercise 27 B

1. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{\sin 4x}{6x}$$



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2. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{\sin 5x}{\sin 8x}$$



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3. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{\tan 3x}{\tan 5x}$$



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4. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{\tan \alpha x}{\tan \beta x}$$



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5. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{\sin 4x}{6x}$$



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6. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{\tan 3x}{\sin 4x}$$



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7. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{\sin mx}{\tan nx}$$



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8. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{(\sin x - 2 \sin 3x + \sin 5x)}{x}$$



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9. Evaluate the following limits:

$$\lim_{x \rightarrow \pi/6} \frac{(2 \sin^2 x + \sin x - 1)}{(2 \sin^2 x - 3 \sin x + 1)}$$



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10. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{(\sin 2x + 3x)}{(2x + \sin 3x)}$$

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11. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{(\tan 2x - x)}{(3x - \tan x)}$$

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12. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{(x^2 - \tan 2x)}{\tan x}$$

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13. Evaluate the following limits: $\lim_{x \rightarrow 0} \frac{(x \cos x + \sin x)}{(x^2 + \tan x)}$

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14. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{(\tan x - \sin x)}{\sin^3 x}$$



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15. Evaluate the following limits:

$$\lim_{x \rightarrow 0} (x \operatorname{cosec} x)$$



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16. Evaluate the following limits:

$$\lim_{x \rightarrow 0} (x \cot 2x)$$



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17. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{\sin x \cos x}{3x}$$



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18. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{\sin(x/4)}{x}$$



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19. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{\tan(x/2)}{3x}$$



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20. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{(1 - \cos x)}{\sin^2 x}$$



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21. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{(1 - \cos 3x)}{x^2}$$



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22. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{(1 - \cos 2x)}{\sin^2 2x}$$



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23. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{(1 - \cos 2x)}{3 \tan^2 x}$$



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24. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{(1 - \cos 2x)}{(1 - \cos 6x)}$$



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25. Evaluate, $\lim_{x \rightarrow 0} \frac{1 - \cos mx}{1 - \cos nx}$



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26. Evaluate $\lim_{x \rightarrow 0} \frac{2 \sin x - \sin 2x}{x^3}$



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27. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{(\tan x - \sin x)}{\sin^3 x}$$



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28. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{(\tan 2x - \sin 2x)}{x^3}$$



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29. $\lim_{x \rightarrow 0} \frac{\operatorname{cosec} x - \cot x}{x}$ is equal to



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30. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{(\cot 2x - \operatorname{cosec} x)}{x}$$



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31. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{(\operatorname{cosec} x - \cot x)}{x^3}$$



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32. $\lim_{x \rightarrow (\pi/4)} \frac{\sec^x - 2}{\tan x - 1}$ is

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33. Evaluate the following limits:

$$\lim_{x \rightarrow \frac{\pi}{4}} \frac{(\cos e^{c^2 x} - 2)}{(\cot x - 1)}$$

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34. Evaluate the following limits: $\lim_{x \rightarrow \frac{\pi}{4}} \frac{\tan x - 1}{\left(x - \frac{\pi}{4}\right)}$

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35. $\lim_{x \rightarrow \pi} \left(\frac{\sin 3x - 3 \sin x}{(\pi - x)^3} \right)$

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36. Evaluate: $(\lim)_{x \rightarrow \frac{\pi}{2}} \frac{1 + \cos 2x}{(\pi - 2x)^2}$

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37. Evaluate the following limits:

$$\lim_{x \rightarrow a} \frac{(\sin x - \sin a)}{(x - a)}$$

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38. Evaluate the following limits:

$$\lim_{x \rightarrow a} \frac{(\sin x - \sin a)}{(x - a)}$$

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39. Evaluate the following limits: $\lim_{x \rightarrow a} \frac{(\sin x - \sin a)}{(\sqrt{x} - \sqrt{a})}$



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40. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{(\sin 5x - \sin 3x)}{\sin x}$$



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41. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{(\cos 3x - \cos 5x)}{x^2}$$



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42. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{(\sin 3x + \sin 5x)}{(\sin 6x - \sin 4x)}$$



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43. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{[\sin(2 + x) - \sin(2 - x)]}{x}$$



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44. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{(1 - \cos 2x)}{(\cos 2x - \cos 8x)}$$



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45. Evaluate the following limits:

$$\lim_{x \rightarrow \frac{\pi}{2}} \left(\frac{\pi}{2} - x \right) \tan x$$



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46. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{(\sqrt{1 + 2x} - \sqrt{1 - 2x})}{\sin x}$$



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47. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{(e^{\tan x} - 1)}{\tan x}$$



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48. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{(e^{3+x} - \sin x - e^3)}{x}$$



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49. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{(e^{\tan x} - 1)}{\tan x}$$



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50. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{(e^{\tan x} - 1)}{x}$$



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51. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{ax + x \cos x}{b \sin x}$$



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52. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{\sin ax + bx}{ax + \sin bx}, \text{ where } a, b, a + b \neq 0$$



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$$53. \lim_{x \rightarrow \pi} \left(\frac{\sin(\pi - x)}{\pi(\pi - x)} \right)$$



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54. $\lim_{x \rightarrow \frac{\pi}{2}} \frac{\tan 2x}{x - \frac{\pi}{2}}$



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55. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{\cos 2x - 1}{\cos x - 1}$$



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56. Evaluate the following limits:

$$\lim_{x \rightarrow 0} (\cos ex - \cot x)$$



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57. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{1 - \cos 2mx}{1 - \cos 2nx}$$



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58. Evaluate, $\lim_{x \rightarrow 0} \frac{1 - \cos mx}{1 - \cos nx}$



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59. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{\sin^2 mx}{\sin^2 nx}$$



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60. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{\sin 2x + \sin 3x}{2x + \sin 3x}$$



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61. The value of $\lim_{x \rightarrow 0} \frac{\sec 4x - \sec 2x}{\sec 3x - \sec x}$ is



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62. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{\sqrt{2} - \sqrt{1 + \cos x}}{2x + \sin 3x}$$



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63. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{\sqrt{1 + \sin x} - \sqrt{1 - \sin x}}{x}$$



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64.
$$\lim_{x \rightarrow \frac{\pi}{6}} \frac{2 - \sqrt{3} \cos x - \sin x}{(6x - \pi)^2}$$



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65. Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{\cos ax - \cos bx}{\cos cx - 1}$$

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66. Evaluate the following limits:

$$\lim_{x \rightarrow a} \frac{\cos x - \cos a}{\cot x - \cot a}$$

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67.
$$\lim_{x \rightarrow \frac{\pi}{4}} \frac{\tan^3 x - \tan x}{\cos\left(x + \frac{\pi}{4}\right)}$$

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68. Evaluate the following limits:

$$\lim_{x \rightarrow \frac{\pi}{2}} \frac{\sqrt{2} - \sqrt{1 + \sin x}}{\sqrt{2} \cos^2 x}$$



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69. Evaluate the following limit: $(\lim)_{x \rightarrow \frac{\pi}{6}} \frac{\cot^2 x - 3}{\cos e c x - 2}$



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70. Evaluate the following limits:

$$\lim_{x \rightarrow \pi} \frac{\sqrt{2 + \cos x} - 1}{(\pi - x)^2}$$



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71. Evaluate the following limits:

$$\lim_{x \rightarrow \frac{\pi}{4}} \frac{1 - \tan x}{1 - \sqrt{2} \sin x}$$



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72. Evaluate the following limits: $\lim_{x \rightarrow \frac{\pi}{6}} \frac{2 \sin^2 x + \sin x - 1}{2 \sin^2 x - 3 \sin x + 1}$

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Exercise 27 C

1. If $y(x) = |x| - 3$, find $\lim_{x \rightarrow 3} f(x)$.

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2. Let $f(x) \begin{cases} \frac{x}{|x|}, & x \neq 0 \\ 0, & x = 0 \end{cases}$

Show that $\lim_{x \rightarrow 0} f(x)$ does not exist.

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3. Let $f(x) = \begin{cases} \frac{|x-3|}{(x-3)}, & x \neq 3 \\ 0, & x = 3. \end{cases}$

Show that $\lim_{x \rightarrow 3} f(x)$ does not exist.

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4. Let $f(x) = \begin{cases} 1 + x^2, & 0 \leq x \leq 1 \\ 2 - x, & x > 1. \end{cases}$

Show that $\lim_{x \rightarrow 0} f(x)$ does not exist.

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5. Let $f(x) = \begin{cases} \frac{|x|}{x}, & x \neq 0 \\ 2, & x = 0. \end{cases}$

Show that $\lim_{x \rightarrow 0} f(x)$ does not exist.

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6. Let $f(x) = \begin{cases} 5x - 4, & 0 < x \leq 1 \\ 4x^3 - 3x, & 1 < x < 2. \end{cases}$

Find $\lim_{x \rightarrow 1} f(x)$.



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7. Let $f(x) = \begin{cases} 4x - 5, & x \leq 2 \\ x - a, & x > 2. \end{cases}$

If $\lim_{x \rightarrow 2} f(x)$ exists then find the value of a .



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8. Let $f(x) = \begin{cases} \frac{3x}{|x| + 2x}, & x \neq 0 \\ 0, & x = 0. \end{cases}$

Show that $\lim_{x \rightarrow 0} f(x)$ does not exist.



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9. Let $f(x) = \begin{cases} \frac{3x}{|x|+2x}, & x \neq 0 \\ 0, & x = 0. \end{cases}$

Show that $\lim_{x \rightarrow 0} f(x)$ does not exist.

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10. Show that $\lim_{x \rightarrow 0} \frac{1}{x}$ does not exist.

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11. Show that $\lim_{x \rightarrow 0} \frac{1}{|x|} = \infty$.

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12. Show that $\lim_{x \rightarrow 0} e^{-1/x}$ does not exist.

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13. Show that $\lim_{x \rightarrow 0} \sin \frac{1}{x}$ does not exist.



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14. Show that $\lim_{x \rightarrow 2} \frac{x}{[x]}$ does not exist.



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15. Let $f(x) = \begin{cases} \frac{k \cos x}{\pi - 2x}, & x \neq \frac{\pi}{2} \\ 3, & x = \frac{\pi}{2}. \end{cases}$

If $\lim_{x \rightarrow \frac{\pi}{2}} f(x) = f\left(\frac{\pi}{2}\right)$, find the value of k .



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