

## Limits

Evaluate each limit.

- $\lim_{x \rightarrow 0} \frac{x^2}{\ln \cos x}$
- $\lim_{x \rightarrow 0} \frac{e^x - e^{-x} - 2x}{x - \sin x}$
- $\lim_{x \rightarrow 0^+} (\tan x) \ln x$
- $\lim_{x \rightarrow 0} \frac{\sin x - x \cos x}{x - \sin x}$
- $\lim_{x \rightarrow 1^+} \left( \frac{1}{\ln x} - \frac{1}{x-1} \right)$
- $\lim_{x \rightarrow 0} \frac{\tan x - \sin x}{x^3}$
- $\lim_{x \rightarrow \frac{\pi}{2}^-} (2x \tan x - \pi \sec x)$
- $\lim_{x \rightarrow 0^+} \left( \frac{1}{x-1} - \frac{2}{x^2-1} \right)$
- $\lim_{x \rightarrow 0^+} \frac{e^{-1/x}}{x}$
- $\lim_{x \rightarrow 0} \frac{\sin x - x \cos x}{x^2 \sin x}$
- $\lim_{x \rightarrow 0^+} \frac{x - \arctan x}{x^3}$
- $\lim_{x \rightarrow \infty} \left( 1 - \frac{1}{x} \right)^x$
- $\lim_{x \rightarrow 0} \left( \frac{1}{x} - \frac{\ln|x+1|}{x^2} \right)$
- $\lim_{x \rightarrow \infty} \left( 1 - \sin \frac{1}{x} \right)^{2x}$
- $\lim_{x \rightarrow \infty} x^2 e^{-x}$
- $\lim_{x \rightarrow 0^+} \left( \frac{1}{\sin x} - \frac{1}{x} \right)$
- $\lim_{x \rightarrow 2} \left( \frac{1}{\ln(x-1)} - \frac{1}{x-2} \right)$
- $\lim_{x \rightarrow 0} \frac{\tan x - x}{x - \sin x}$
- $\lim_{x \rightarrow 0^+} (1+2x)^{1/x^2}$
- $\lim_{x \rightarrow 0^+} \frac{1 - \sin 2x}{x}$
- $\lim_{x \rightarrow \infty} e^{-x} \ln x$
- $\lim_{x \rightarrow 0^+} (1-2x)^{1/x}$
- $\lim_{x \rightarrow 0^-} \frac{\cos(\frac{\pi}{2} - x)}{\arctan x}$
- $\lim_{x \rightarrow 0^+} (1-2x)^{\cot x}$
- $\lim_{x \rightarrow \frac{\pi}{2}^-} \frac{\sec x + 5}{3 \tan x}$
- $\lim_{x \rightarrow \infty} x \ln \left( 1 + \frac{a}{x} \right)$
- $\lim_{x \rightarrow \infty} x - \sqrt{x^2 - 10}$
- $\lim_{x \rightarrow 0^+} (e^x + x)^{1/x}$
- $\lim_{x \rightarrow \infty} x \sin \frac{1}{x}$
- $\lim_{x \rightarrow \frac{\pi}{2}} (\sec x - \tan x)$
- $\lim_{x \rightarrow 0^+} (x^x)^x$
- $\lim_{x \rightarrow 0} \frac{e^x - e^{-x}}{\sin x}$
- $\lim_{x \rightarrow 0^+} \left( \frac{1}{x} + \ln x \right)$
- $\lim_{x \rightarrow \infty} \left( 1 + \frac{1}{3x} \right)^x$
- $\lim_{x \rightarrow 0} (1-2x)^{2/x}$
- $\lim_{x \rightarrow 0^+} \frac{e^{2x}}{x \cos x}$
- $\lim_{x \rightarrow 0} \frac{x - \sin x}{x - \tan x}$
- $\lim_{x \rightarrow 0} (1 + \tan x)^{1/x}$
- $\lim_{x \rightarrow 1} \left( \frac{1}{\ln x} - \frac{x}{\ln x} \right)$
- $\lim_{x \rightarrow 0^+} \frac{\ln x}{\csc x}$
- $\lim_{x \rightarrow 0^+} \left( \frac{2}{\sin^2 x} - \frac{1}{1 - \cos x} \right)$
- $\lim_{x \rightarrow \infty} \left( 1 - \frac{3}{x} \right)^x$
- $\lim_{x \rightarrow \infty} \frac{x^3}{e^x}$
- $\lim_{x \rightarrow 0} (1 + \sin x)^{1/3x}$
- $\lim_{x \rightarrow 0} \frac{x e^{2x}}{4 \tan x}$
- $\lim_{x \rightarrow 0^+} \left( \cot x - \frac{1}{x} \right)$
- $\lim_{x \rightarrow 0^+} \left( \frac{1}{x} \right)^{\sin x}$
- $\lim_{x \rightarrow \infty} \left( \frac{x+2}{x} \right)^x$
- $\lim_{x \rightarrow 0^+} \left( \frac{1}{x} - \frac{1}{e^x - 1} \right)$
- $\lim_{x \rightarrow 1^+} \left( \frac{1}{\ln x} + \frac{1}{x-1} \right)$
- $\lim_{x \rightarrow 2\pi} \left( 3 - \frac{x}{\pi} \right)^{\csc x}$
- $\lim_{x \rightarrow -\frac{\pi}{2}} \left( \frac{\pi}{2} + x \right) \sec x$
- $\lim_{x \rightarrow 1} \frac{1-x + \ln x}{1 + \cos \pi x}$
- $\lim_{x \rightarrow 0} (1+3x)^{\csc x}$

55.  $\lim_{x \rightarrow \frac{\pi}{2}^-} (\sec x - \tan x)$
56.  $\lim_{x \rightarrow \frac{\pi}{2}^-} (\cos x) \ln \cos x$
57.  $\lim_{x \rightarrow 0} \frac{e^{2x} - e^{-2x} - 4x}{x^2}$
58.  $\lim_{x \rightarrow \infty} (1 + 8x^2)^{1/x^2}$
59.  $\lim_{x \rightarrow 0} \left[ \frac{1}{\ln(1+x)} - \frac{1}{x} \right]$
60.  $\lim_{x \rightarrow 0} \frac{1 - \cos 2x}{x^2}$
61.  $\lim_{x \rightarrow 0} (1+x)^{1/x}$
62.  $\lim_{x \rightarrow \frac{\pi}{2}} \frac{\cot x - \cos x}{x^2}$
63.  $\lim_{x \rightarrow 0^+} (1+2x)^{1/x}$
64.  $\lim_{x \rightarrow 0^+} \frac{\ln \tan 2x}{\ln \sin 3x}$
65.  $\lim_{x \rightarrow 0} (e^x + x)^{1/x}$
66.  $\lim_{x \rightarrow \frac{\pi}{2}^-} \cos 3x \sec 7x$
67.  $\lim_{x \rightarrow \infty} \left( 1 + \frac{3}{x} \right)^{2x}$
68.  $\lim_{x \rightarrow 0} \frac{e^x - 1}{\sin x}$
69.  $\lim_{x \rightarrow 0^+} \frac{\ln x}{\csc x}$
70.  $\lim_{x \rightarrow 0^+} x^{1/\ln x}$
71.  $\lim_{x \rightarrow 0^+} (\cot x - \ln x)$
72.  $\lim_{x \rightarrow 0^+} (\sin x)^x$
73.  $\lim_{x \rightarrow \frac{\pi}{2}^-} (\tan x - \sec x)$
74.  $\lim_{x \rightarrow 0} \frac{x - \sin x}{x - \tan x}$
75.  $\lim_{x \rightarrow \infty} \left( \frac{x}{x-1} \right)^{x/2}$
76.  $\lim_{x \rightarrow \frac{\pi}{2}^-} \left[ \frac{\sin x}{\cos x} + \frac{1}{x - \frac{\pi}{2}} \right]$
77.  $\lim_{x \rightarrow -\infty} x^2 e^x$
78.  $\lim_{x \rightarrow 0} \frac{\sin x - x \cos x}{x - \sin x}$
79.  $\lim_{x \rightarrow 3^-} \left[ \frac{1}{\ln(x-2)} - \frac{1}{x-3} \right]$
80.  $\lim_{x \rightarrow 0^+} (1+3x^2)^{1/x^2}$
81.  $\lim_{x \rightarrow 1} \frac{x - e^{x-1}}{(x-1)^2}$
82.  $\lim_{x \rightarrow \infty} x \left[ \frac{\pi}{2} - \arctan x \right]$
83.  $\lim_{x \rightarrow \infty} \left( \frac{x}{x+2} \right)^{x+1}$
84.  $\lim_{x \rightarrow 0^+} x^{\tan x}$
85.  $\lim_{x \rightarrow 0^+} (\ln x) \tan x$
86.  $\lim_{x \rightarrow 0} (1 + \sin x)^{1/(2x)}$
87.  $\lim_{x \rightarrow \pi} \frac{\sin x + x - \pi}{1 + \cos x}$
88.  $\lim_{x \rightarrow 0^+} \left( \frac{2}{x} - \frac{1}{1 - \cos x} \right)$
89.  $\lim_{x \rightarrow \frac{\pi}{2}^-} (2x \tan x - \pi \sec x)$
90.  $\lim_{x \rightarrow \infty} (e^x + x)^{1/x}$

Answers:

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|-----|----------------|-----|-----------------|-----|-----------------|-----|---------------|-----|--------------------|-----|-----------------|-----|---------------|-----|-----------------|
| 1.  | -2             | 2.  | 2               | 3.  | 0               | 4.  | 2             | 5.  | $\frac{1}{2}$      | 6.  | $\frac{1}{2}$   | 7.  | -2            | 8.  | 1               |
| 9.  | 0              | 10. | $\frac{1}{3}$   | 11. | $\frac{1}{3}$   | 12. | $\frac{1}{e}$ | 13. | $\frac{1}{2}$      | 14. | $\frac{1}{e^2}$ | 15. | 0             | 16. | 0               |
| 17. | $\frac{1}{2}$  | 18. | 2               | 19. | $\infty$        | 20. | $\infty$      | 21. | 0                  | 22. | $\frac{1}{e^2}$ | 23. | 1             | 24. | $\frac{1}{e^2}$ |
| 25. | $\frac{1}{3}$  | 26. | $a$             | 27. | 0               | 28. | $e^2$         | 29. | 1                  | 30. | 0               | 31. | 1             | 32. | 2               |
| 33. | $\infty$       | 34. | $e^{1/3}$       | 35. | $\frac{1}{e^4}$ | 36. | $\infty$      | 37. | $-\frac{1}{2}$     | 38. | $e$             | 39. | -1            | 40. | 0               |
| 41. | $\frac{1}{2}$  | 42. | $\frac{1}{e^3}$ | 43. | 0               | 44. | $e^{1/3}$     | 45. | $\frac{1}{4}$      | 46. | 0               | 47. | 1             | 48. | $e^2$           |
| 49. | $\frac{1}{2}$  | 50. | $\infty$        | 51. | $e^{-1/\pi}$    | 52. | 1             | 53. | $-\frac{1}{\pi^2}$ | 54. | $e^3$           | 55. | 0             | 56. | 0               |
| 57. | 0              | 58. | 1               | 59. | $\frac{1}{2}$   | 60. | 2             | 61. | $e$                | 62. | 0               | 63. | $e^2$         | 64. | 1               |
| 65. | $e^2$          | 66. | $\frac{3}{7}$   | 67. | $e^6$           | 68. | 1             | 69. | 0                  | 70. | $e$             | 71. | $\infty$      | 72. | 1               |
| 73. | 0              | 74. | $-\frac{1}{2}$  | 75. | $e^{1/2}$       | 76. | 0             | 77. | 0                  | 78. | 2               | 79. | $\frac{1}{2}$ | 80. | $e^3$           |
| 81. | $-\frac{1}{2}$ | 82. | 1               | 83. | $\frac{1}{e^2}$ | 84. | 1             | 85. | 0                  | 86. | $e^{1/2}$       | 87. | 0             | 88. | $-\infty$       |
| 89. | -2             | 90. | $e$             |     |                 |     |               |     |                    |     |                 |     |               |     |                 |