L'Hopital's Rule for Indeterminate Forms - Homework

Basic Problems - calculate your answers and check on your calculators

1. $\lim_{x\to -1}\dfrac{2x^2-x-3}{x+1}$

2. $\lim_{x\to 3}\dfrac{x^2-x-6}{x-3}$

3. $\lim_{x\to 3}\dfrac{x^2-x-3}{x-2}$

4. $\lim_{x\to 1}\dfrac{x-1}{\sqrt{x^2+3}-2}$

5. $\lim_{r\to 1}\dfrac{1-r^3}{2-\sqrt{r^2+3}}$

6. $\lim_{x\to 1}\dfrac{x^3-3x+2}{x^3-x^2-x+1}$

7. $\lim_{x\to 1}\dfrac{1-x+\ln x}{x^3-3x+2}$

8. $\lim_{x\to 0}\dfrac{x}{1-e^x}$

9. $\lim_{x\to 0}\dfrac{x\cos x-\sin x}{x}$

10. $\lim_{x\to 0}\dfrac{\sin 2x\,\tan x}{3x}$

11. $\lim_{x\to 0}\dfrac{\sin 2x+\tan x}{6x}$

12. $\lim_{x\to 0}\dfrac{\tan x-x}{x-\sin x}$

13. $\lim_{x\to 0}\dfrac{e^{x}-e^{-x}-2x}{x-\sin x}$

14. $\lim_{x\to 0}\dfrac{10^{2x}-2x-10^{-2x}}{10^{2x}-10^{-2x}}$

15. $\lim_{x\to\infty}\dfrac{x^{2}-1}{4x^{2}+x}$

16. $\lim_{x\to\infty}\dfrac{2x^{2}+4x-7}{x^{3}+3x^{2}-5}$

17. $\lim_{x\to\infty}\frac{x^3}{e^x}$

18. $\lim_{x\to\infty}\frac{\sqrt{x^2-1}}{2x+1}$

19. $\lim_{x\to-\infty}\frac{x^2}{x+1}$

20. $\lim_{x\to 0}\frac{\ln x}{\frac{1}{x}}$

21. $\lim_{x\to\infty}\frac{e^x}{\ln x}$

22. $\lim_{x\to\infty}\frac{\sqrt{x}}{e^x}$

23. $\lim_{x\to\infty} x^2 e^{-3x}$

24. $\lim_{x\to\frac{\pi}{2}}\frac{\sec x}{\sec^2 3x}$

25. $\lim_{x\to 0^+}\left(x^2\ln x\right)$

26. $\lim_{x\to 0}\left(\csc x-\cot x\right)$

27. $\lim_{x\to 0}\left[\frac{1}{\sin x}-\frac{1}{x}\right]$

28. $\lim_{x\to 1}\left[\frac{1}{\ln x}-\frac{1}{x-1}\right]$

More advanced L'Hopital's Rule Problems - Calculate your answers and check on your calculators

29. $\lim_{x\to 0} x^{(x^2)}$

30. $\lim_{x\to 0}(1+x)^{1/x}$

31. $\lim_{x\to 0^+}\left(\frac{1}{x}\right)^{\sin x}$

32. $\lim_{x\to \pi/2^-}(\tan x)^{\cos x}$

Limits of the type $\frac{0}{\infty}$, $\frac{\infty}{0}$, 0^{∞}, $\infty \bullet \infty$, $\infty + \infty$ are **not** indeterminate forms. Find the following by inspection:

33. $\lim_{x\to 0^+}\frac{x}{\ln x}$

33. $\lim_{x\to(\pi/2)^-}(\cos x)^{\tan x}$

34. $\lim_{x\to(\pi/2)^-}\left(\frac{2}{\pi-2x}+\tan x\right)$