

4.6

L'Hospital's Rule Homework

Name _____
Date _____ Period _____

Use L'Hospital's Rule to evaluate the limit, if it exists, or state that L'Hospital's Rule does not apply.

1. $\lim_{x \rightarrow -3} \frac{x^2 - 9}{x^3 - 6x - x^2}$

2. $\lim_{x \rightarrow 2} \frac{3x^2 - 5x - 2}{x - 3}$

3. $\lim_{x \rightarrow 1} \frac{\sqrt{x+3} - 2}{x^3 - 4x + 3}$

4. $\lim_{x \rightarrow 0} \frac{\sin 5x}{2x}$

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

6. $\lim_{x \rightarrow \infty} \frac{x}{e^x}$

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

8. $\lim_{x \rightarrow 0} \frac{x}{1 - e^x}$

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

10. $\lim_{x \rightarrow \infty} \frac{e^{2x} - x - 1}{x^2}$

11. $\lim_{x \rightarrow 0} \frac{\tan x}{x}$

12. $\lim_{x \rightarrow 0} \frac{e^x - 2}{\sin x}$

13. $\lim_{x \rightarrow \infty} \frac{x^{2/3} + 2x}{x^{5/3} - x}$

14. $\lim_{x \rightarrow 0} \frac{x^3}{\sin x - x}$

15. $\lim_{x \rightarrow 1} \frac{\tan^{-1} x - \frac{\pi}{4}}{x - 1}$

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

17. $\lim_{x \rightarrow \infty} \frac{x}{\sqrt{x^2 + 1}}$

18. $\lim_{x \rightarrow \infty} \frac{\ln x}{\sqrt{x}}$

Questions 19 - 22, Multiple Choice Practice

19. Find $\lim_{x \rightarrow 1^+} \left(\frac{x}{\ln x} \right)$

- A. 0
- B. 1
- C. e
- D. $+\infty$

20. What is $\lim_{x \rightarrow 0} \frac{e^x - 1}{\tan x}$

- A. -1
- B. 0
- C. 1
- D. The limit does not exist

21. If $\lim_{x \rightarrow +\infty} f(x) = \lim_{x \rightarrow +\infty} g(x) = +\infty$, and $f'(x) = 1$ and $g'(x) = e^x$, what is $\lim_{x \rightarrow +\infty} \frac{f(x)}{g(x)}$?

- A. 0
- B. 1
- C. e
- D. The limit does not exist

22. Evaluate.

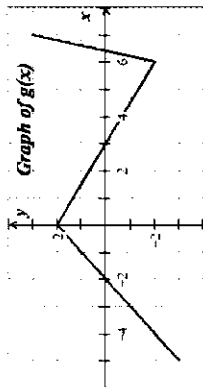
$$\lim_{x \rightarrow 1} \left(\frac{1 - \frac{1}{x}}{1 - x^2} \right)$$

- A. 2
- B. 1
- C. $\frac{1}{2}$
- D. The limit does not exist

For each of the following, find the limit, if it exists, and justify your reasoning.

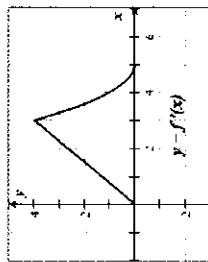
23. Use the graph of $g(x)$, shown at right to find the limit, if it exists

$$\lim_{x \rightarrow -2} \frac{g(x+5)}{x^2+3x+2}$$



24. The function $f(x)$ is differentiable and the graph of $f'(x)$ is shown at right. Given that $f(3) = 0$, find the following. Justify your reasoning.

$$\lim_{x \rightarrow 3} \frac{x^2 - 9}{f(x)}$$



25. The function $h(x)$ is twice differentiable and $h(-1) = 0$. The differential equation for the curve $y = h(x)$ is given by $\frac{dy}{dx} = 2^x(y - 3)$. Find the limit, if it exists. Explain your reasoning.

$$\lim_{x \rightarrow -1} \frac{x + e^{x+1}}{x^2 + x}$$

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