

CALCULUS BC
WORKSHEET 3 ON LIMITS

Find the limit. Draw a sketch for each problem . Do not use your calculator.

1. $\lim_{x \rightarrow 1^+} \frac{1}{x-1} =$

2. $\lim_{x \rightarrow 1} \frac{1}{x-1} =$

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

4. $\lim_{x \rightarrow 5^-} \frac{1}{5-x} =$

5. $\lim_{x \rightarrow 5^-} \frac{1}{(5-x)^2} =$

6. $\lim_{x \rightarrow 2} \frac{-1}{(x-2)^2} =$

7. $\lim_{x \rightarrow 3} \frac{|x-3|}{x-3} =$

8. $\lim_{x \rightarrow 2} \lfloor x + 1 \rfloor =$

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

10. $\lim_{x \rightarrow 4^-} \frac{x^3 \lceil x-4 \rceil}{x-4} =$

11. $f(x) = \begin{cases} x^2 - 1 & \text{if } x < 2 \\ 3x - 2 & \text{if } x > 2 \end{cases}$

a) $\lim_{x \rightarrow 2^-} f(x) =$

b) $\lim_{x \rightarrow 2^+} f(x) =$

c) $\lim_{x \rightarrow 2} f(x) =$

12. $\lim_{x \rightarrow 3^+} \left(x - 3 - \frac{1}{x-3} \right) =$

13. $g(x) = \begin{cases} x-3 & \text{if } x \neq 1 \\ 4 & \text{if } x = 1 \end{cases} \quad \lim_{x \rightarrow 1} g(x) =$

14. $h(x) = \begin{cases} x+3 & \text{if } x < 1 \\ 3x^2 + 1 & \text{if } x > 1 \end{cases} \quad \lim_{x \rightarrow 1} h(x) =$

15. $\lim_{x \rightarrow \frac{\pi}{2}^+} \tan x =$

16. $\lim_{x \rightarrow -\frac{\pi}{2}^+} \sec x =$

17. $\lim_{x \rightarrow \pi^-} \csc x =$

18. $\lim_{x \rightarrow 0^-} \cot x =$

TURN--->>>

On problems 19 - 24:

(a) find $\lim_{x \rightarrow \infty} f(x)$

(b) find $\lim_{x \rightarrow -\infty} f(x)$

(c) identify all horizontal asymptotes.

Use your graphing calculator on problems 23 and 24.

19. $f(x) = \frac{3x^3 - x + 1}{x + 3}$

20. $f(x) = \frac{4x^2 - 3x + 5}{2x^3 + x - 1}$

21. $f(x) = \frac{3x + 1}{x - 4}$

22. $f(x) = \frac{3x + 1}{|x| + 2}$

23. $f(x) = \frac{\sin 3x}{x}$

24. $f(x) = \cos\left(\frac{1}{x}\right)$

On problems 25 - 28,

(a) find the vertical asymptotes of $f(x)$

(b) describe the behavior of $f(x)$ to the left and right of each vertical asymptote.

Use your calculator on problems 25 - 27.

25. $f(x) = \frac{1}{x^2 - 4}$

26. $f(x) = \frac{x^2 + 5x + 6}{x^2 - 4}$

27. $f(x) = \frac{x^2 - 2x}{x + 1}$

28. $f(x) = \sec x$