

**AP CALCULUS AB  
WORKSHEET #1**

Find the indicated limit. Which method is most appropriate: Direct Substitution, Numerical, Analytic or Graphical?

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

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

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

4.  $\lim_{x \rightarrow 0^-} \frac{x + 1}{x}$

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

6.  $\lim_{\Delta x \rightarrow 0} \frac{(x + \Delta x)^3 - x^3}{\Delta x}$

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

8.  $\lim_{x \rightarrow 1} \frac{\frac{1}{\sqrt{x}} - 1}{x - 1}$

9.  $\lim_{\theta \rightarrow 0} \frac{\theta^2 + 2\theta}{\sin 2\theta}$

10.  $\lim_{s \rightarrow 1} f(s)$ ; where  $f(s) = \begin{cases} s & s < 1 \\ 1 - s & s > 1 \end{cases}$

11.  $\lim_{s \rightarrow 1} f(s)$ ; where  $f(s) = \begin{cases} s & s < 3 \\ 6 - s & s > 3 \end{cases}$

Find the discontinuities (if any) for each function. Identify which are Removable and which are Nonremovable Jump or Nonremovable Infinite? Analyze each initially without a graph, then draw a sketch afterwards to confirm.

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

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

14.  $f(x) = \lfloor \lfloor x + 3 \rfloor \rfloor$

15.  $f(x) = \frac{3x^2 - x - 2}{x - 1}$

16.  $f(x) = \frac{x + 1}{2x + 2}$

17.  $f(x) = \begin{cases} -2x + 3 & x < 1 \\ x^2 & x \geq 1 \end{cases}$

18.  $f(x) = \begin{cases} \frac{x + 5}{3} & x < 1 \\ 3 - x^3 & x > 1 \end{cases}$

19.  $f(x) = \begin{cases} \cos x & x < 0 \\ x + 2 & x \geq 0 \end{cases}$

**AP CALCULUS AB  
WORKSHEET #2**

Find the indicated limit.

1.  $\lim_{\theta \rightarrow 0} \frac{\theta}{\sin \theta}$

2.  $\lim_{\theta \rightarrow 0} \frac{\tan \theta}{\theta}$

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

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

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

6.  $\lim_{\theta \rightarrow 0} \frac{\sin^2 \theta}{\theta}$

7.  $\lim_{\theta \rightarrow 0} \frac{1 - \cos \theta}{\theta}$

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

9.  $\lim_{y \rightarrow 0} \frac{\tan 2y}{3y}$

10.  $\lim_{\theta \rightarrow 0} \theta \cot 2\theta$

11.  $\lim_{x \rightarrow 0} \frac{\sin 2x}{2x^2 + x}$

12.  $\lim_{x \rightarrow 0} \tan 2x \csc 4x$

13.  $\lim_{x \rightarrow 0} \cot x \sin 4x$

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

15.  $\lim_{x \rightarrow 0} \frac{\tan 3x}{\tan 2x}$

16.  $\lim_{x \rightarrow 0} \frac{x^2}{\sin x}$

Answers:

**AP CALCULUS AB  
WORKSHEET #3**

Find the indicated limit.

1.  $\lim_{x \rightarrow 0} \frac{3}{x} - \frac{3 \cos x}{x}$

2.  $\lim_{x \rightarrow \pi} \tan x$

3.  $\lim_{x \rightarrow 7} \sec \frac{\pi x}{6}$

4.  $\lim_{x \rightarrow 1} f(x)$ ; where  $f(x) = \begin{cases} |x| & |x| \leq 1 \\ 2 - |x| & |x| > 1 \end{cases}$ ;  
(Graphically)

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

6.  $\lim_{x \rightarrow \infty} \frac{5x^3+1}{10x^3-3x^2+7}$

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

8.  $\lim_{x \rightarrow -3} \frac{2}{x+2}$

9.  $\lim_{x \rightarrow 1} \sin \frac{\pi x}{2}$

10.  $\lim_{x \rightarrow \infty} \left(1 + \frac{1}{x}\right)^x$

11.  $\lim_{x \rightarrow 0} \frac{x^2-3x}{x}$

12.  $\lim_{\theta \rightarrow \pi} \theta \sec \theta$

13.  $\lim_{x \rightarrow 4^-} \frac{\sqrt{x}-2}{x-4}$

14.  $\lim_{x \rightarrow 0} \frac{\tan^2 x}{x}$

15.  $\lim_{h \rightarrow 0} (1 + \cos 2h)$

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

17.  $\lim_{x \rightarrow \pi/2^+} \sec x$

18.  $\lim_{\Delta x \rightarrow 0} \frac{5(x+\Delta x)^2 - 5x^2}{\Delta x}$

19.  $\lim_{x \rightarrow \infty} \frac{x^3 - 2x^2 + 3x + 1}{x^2 - x + 2}$

20.  $\lim_{x \rightarrow \infty} (x+3)^{-2}$

Find the interval for which the function is continuous.

21.  $f(x) = x\sqrt{x+3}$

22.  $f(x) = \frac{x+1}{\sqrt{x}}$

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

24.  $f(x) = \frac{1}{\sqrt{x-4}-3}$

Find the discontinuities (if any) for the given function. State whether they are Removable, Nonremovable Jump or Nonremovable Infinite. Use your TI-83/84 to verify your responses.

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

$$26. f(x) = \frac{x-1}{x^2 + x - 2}$$

$$27. f(x) = \cos \frac{\pi x}{2}$$

$$28. f(x) = \begin{cases} x & x < 1 \\ 2 & x = 1 \\ 2x-1 & x > 1 \end{cases}$$

$$29. f(x) = \begin{cases} x+3 & |x| > 3 \\ x^2 + x - 6 & |x| \leq 3 \end{cases}$$

$$30. f(x) = \begin{cases} -2x & x \leq 2 \\ x^2 - 4x + 1 & x > 2 \end{cases}$$

$$31. f(x) = \begin{cases} \tan \frac{\pi x}{4} & |x| < 1 \\ x & |x| \geq 1 \end{cases}$$

**AP CALCULUS AB  
WORKSHEET #4**

Find each of the following limits.

1.  $\lim_{x \rightarrow \infty} \frac{4x^3 - 6x^2 + 3}{5x^3 + 7x^2 - 9}$

2.  $\lim_{x \rightarrow \infty} \frac{9x^4 + 7x^2 + 8x}{4x^5 + 3x - 12}$

3.  $\lim_{x \rightarrow \infty} \frac{3x^3 - 7x^2 + 5x + 1}{7x^2 + 2x + 5}$

4.  $\lim_{x \rightarrow \infty} \frac{(-1)^x}{x}$

5.  $\lim_{x \rightarrow \infty} \sec \frac{1}{x}$

6.  $\lim_{x \rightarrow 5} \frac{x^2 - 25}{x - 5}$

7.  $\lim_{x \rightarrow 4} \frac{x - 4}{\sqrt{x} - 2}$

8.  $\lim_{x \rightarrow 3} \frac{x^2 - 5x + 6}{x - 3}$

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

10.  $\lim_{x \rightarrow 0^+} \frac{x}{|x|}$

11.  $\lim_{x \rightarrow 4^-} \frac{|x - 4|}{x - 4}$

12.  $\lim_{x \rightarrow \infty} \frac{2^{-x}}{2^x}$

13.  $\lim_{x \rightarrow 3} \frac{\frac{1}{x} - \frac{1}{3}}{x - 3}$

14.  $\lim_{x \rightarrow 0} \frac{\sqrt{2} - \sqrt{2-x}}{x}$

15.  $\lim_{x \rightarrow 3^+} \lceil x \rceil$

16.  $\lim_{x \rightarrow 3^-} \lfloor x + 2 \rfloor$

17.  $\lim_{x \rightarrow 3} \frac{1}{x - 3}$

18.  $\lim_{x \rightarrow 3^-} \frac{1}{x - 3}$

19.  $\lim_{x \rightarrow \pi/2} \tan x$

20.  $\lim_{x \rightarrow \pi^+} \csc x$

21.  $\lim_{x \rightarrow \infty} \left( \frac{1}{3} \right)^x$

22.  $\lim_{x \rightarrow 1} f(x)$ ; where

$$f(x) = \begin{cases} 2x & x > 1 \\ 3 - x & x \leq 1 \end{cases}$$

23.  $\lim_{x \rightarrow 2} g(x)$ ; where  $g(x) = \begin{cases} x^2 & x \geq 2 \\ -2x & x < 2 \end{cases}$

