

LIMITS 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. $\lim_{s \rightarrow 3} f(s)$; 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. $f(x) = \lfloor [x + 3] \rfloor$

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

ANSWERS:

- 7
- 1
- 5
- $-\infty$
- ∞
- $3x^2$
- 2
- 1/2
- 1
- DNE
- 3
- None, contin $(-\infty, \infty)$
- Nonremovable @ $x = \pm 1$

- Nonremovable @ every integer
- Removable @ $x = 1$
- Removable @ $x = -1$