

Practice (after trig)

Key

Name: _____

Algebraic Limits

$$1. \lim_{x \rightarrow 1} \frac{x^4 - x^3 + 1}{x^2 + 9} = \frac{1 - 1 + 1}{10} = \frac{1}{10}$$

$$2. \lim_{x \rightarrow 2} \frac{x-2}{x+4} = \frac{2-2}{2+4} = \frac{0}{6} = 0$$

$$3. \lim_{x \rightarrow 0} \frac{1}{x^2} = \frac{1}{0} \rightarrow \text{DNE}$$

$$4. \lim_{x \rightarrow 1} \frac{x-1}{x^2-1} = \frac{\cancel{(x-1)}}{(x+1)\cancel{(x-1)}} = \frac{1}{x+1} = \frac{1}{1+1} = \frac{1}{2}$$

$$5. \lim_{x \rightarrow 0} \frac{\sin^2 x}{x} = \frac{\sin x \cdot \sin x}{x} = 1$$

$$\lim_{x \rightarrow 0} \sin x = \sin 0 = 0$$

$$6. \lim_{x \rightarrow 3} \frac{\sqrt{x+1}-2}{x-3} = \frac{\sqrt{3+1}-2}{3-3} \rightarrow \frac{0}{0}$$

$$\frac{(\sqrt{x+1}-2)(\sqrt{x+1}+2)}{(x-3)(\sqrt{x+1}+2)} = \frac{x+1-4}{(x-3)(\sqrt{x+1}+2)} = \frac{x-3}{(x-3)(\sqrt{x+1}+2)} = \frac{1}{\sqrt{x+1}+2}$$

$$7. \lim_{x \rightarrow 0} \frac{\tan^2 x}{x} = \lim_{x \rightarrow 0} \frac{\sin^2 x}{\cos^2 x} \cdot \frac{1}{x} = \lim_{x \rightarrow 0} \frac{1}{\sqrt{x+1}+2} = \frac{1}{4}$$

$$\lim_{x \rightarrow 0} \frac{\sin x}{x} \cdot \frac{\sin x}{\cos^2 x} = \lim_{x \rightarrow 0} \frac{\sin x}{\cos^2 x} = 0$$

$$8. \lim_{x \rightarrow 0} \frac{1}{x} = \text{DNE}$$

9. Does the $\lim_{x \rightarrow 2} f(x)$ exist? If so, give the limit. If not, explain why.

$$f(x) = \begin{cases} 3-x, & x < 2 \\ \frac{x}{2} + 1, & x > 2 \end{cases}$$

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

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

LH and RH limits are not \neq so $\lim_{x \rightarrow 2} f(x)$ DNE

10. Name three places where a limit fails to exist.

a. VA

b. LH and RH don't meet (jump)

c. Oscillation

Practice (after LH/RH)

KEY

AB Calculus

Section 2.1 Day 2 - Solving Limits Algebraically

Find the limit

1. $\lim_{x \rightarrow -2} x^3 + 6x^2 - 16$ 0	2. $\lim_{x \rightarrow 0} \pi^2$ π^2	3. $\lim_{x \rightarrow 4} \frac{x^2 + 9}{x^2 - 1}$ $\frac{5}{3}$
4. $\lim_{x \rightarrow 4} \frac{x^2 - 16}{x^2 + x - 20}$ $\frac{8}{9}$	5. $\lim_{x \rightarrow 0} \frac{x^2 + 2x}{x - 2x^2}$ 0	6. $\lim_{x \rightarrow 1} \frac{1 - x^2}{x^2 + 5x - 6}$ $-\frac{2}{7}$
7. $\lim_{x \rightarrow 1} \frac{x^2 + x - 2}{x^2 - 4x + 3}$ $-\frac{3}{2}$	8. $\lim_{x \rightarrow a} \frac{x^2 - a^2}{x - a}$ $2a$	9. $\lim_{x \rightarrow 3} \frac{x^3 - 27}{x - 3}$ 27
10. $\lim_{x \rightarrow 1} \frac{x^3 - 3x^2 + 2x}{x - 1}$ -1	11. $\lim_{h \rightarrow 2} \frac{h^3 - 4h}{h^3 - 2h^2}$ 2	12. $\lim_{x \rightarrow a} \frac{\frac{1}{x} - \frac{1}{a}}{x - a}$ $-\frac{1}{2a}$
13. $\lim_{h \rightarrow 0} \frac{\frac{1}{3+h} - \frac{1}{3}}{h}$ $-\frac{1}{9}$	14. $\lim_{x \rightarrow -a} \frac{x^3 + a^3}{x + a}$ $3a^2$	15. $\lim_{x \rightarrow 3} \frac{x - 3}{x^3 - 27}$ $\frac{1}{27}$
16. $\lim_{x \rightarrow 2} \frac{1 - \frac{4}{x^2}}{1 - \frac{2}{x}}$ 2	17. $\lim_{h \rightarrow 1} \frac{ h - 2 - 2}{h}$ -1	18. $\lim_{x \rightarrow 4^-} \frac{x - 4}{ x - 4 }$ -1
19. $\lim_{x \rightarrow 1^+} \frac{x - 1}{ x - 1 }$ 1	20. $\lim_{x \rightarrow 6} 10$ 10	21. $\lim_{x \rightarrow 5} \frac{3x}{ x }$ 3
22. $\lim_{x \rightarrow 10^-} \frac{ x - 10 }{x - 10}$ -1	23. $\lim_{x \rightarrow 10^+} \frac{ x - 10 }{x - 10}$ 1	24. $\lim_{x \rightarrow 10} \frac{ x - 10 }{x - 10}$ DNE
25. $\lim_{x \rightarrow 7} \frac{x^2 - 49}{x - 7}$ 14	26. $\lim_{x \rightarrow 9} \frac{x^2 - 81}{x - 9}$ 18	

27. Find $\lim_{x \rightarrow 1} f(x)$ where $f(x) = \begin{cases} \frac{1}{x+2}, & x < 1 \\ 1-2x, & x > 1 \end{cases}$ DNE

28. Find the right hand limit at $x = 1$ for $f(x) = \begin{cases} 1-x, & x > 1 \\ 6, & x = 1 \\ 1+x, & x < 1 \end{cases}$ 0

29. Find the left hand limit at $x = 0$ for $f(x) = \begin{cases} x^3 - 1, & x \geq 0 \\ x + 1, & x < 0 \end{cases}$
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