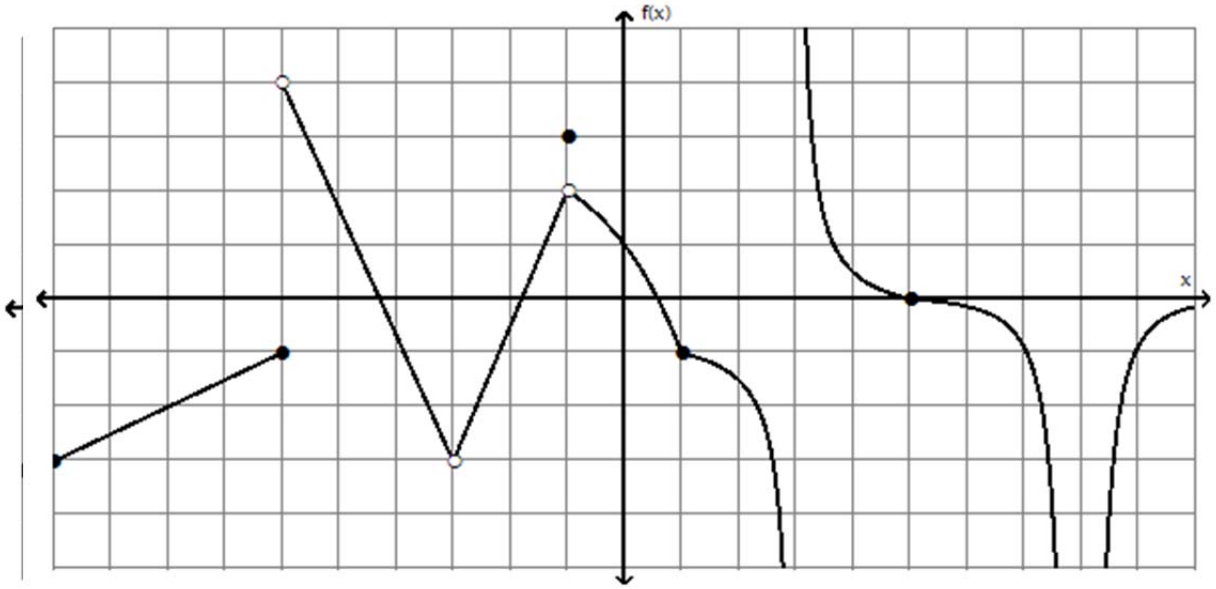
Introduction To Limits **Name** Key



Use the graph above to evaluate each limit, or if appropriate, indicate that the limit does not exist.

1. $\lim_{x\to -6^-} f(x)$ **-1**

2. $\lim_{x\to -6^+} f(x)$ **4**

3. $\lim_{x\to -6} f(x)$ **does not exist**

4. $\lim_{x\to -3^+} f(x)$ **-3**

5. $\lim_{x\to -3} f(x)$ **-3**

6. $\lim_{x\to -1^-} f(x)$ **2**

7. $\lim_{x\to -1^+} f(x)$ **2**

8. $\lim_{x\to -1} f(x)$ **2**

9. $\lim_{x\to 1} f(x)$ **-1**

10. $\lim_{x\to 3^-} f(x)$ **$-\infty$**

11. $\lim_{x\to 3^+} f(x)$ **$+\infty$**

12. $\lim_{x\to 3} f(x)$ **does not exist**

13. $\lim_{x\to 8^+} f(x)$ **$-\infty$**

14. $\lim_{x\to 8} f(x)$ **$-\infty$**

Solution to the Sudoku With Limits Puzzle

A = 3
B = 9
C = 8
D = 5

E = 9
F = 3
G = 2
H= 7

I = 4
J = 6
K = 5
L = 3

M = 6
N = 8
O = 4
P = 7

Q = 3
R = 8
S = 1
T = 3

U = 9
V = 4
W = 4
X = 7

Y = 1
Z = 6
a = 9
b =1

3	5	8	9	6	7	4	1	2
1	6	4	8	2	5	7	9	3
2	9	7	3	4	1	8	6	5
9	2	1	5	7	4	3	8	6
6	8	5	2	9	3	1	4	7
7	4	3	6	1	8	5	2	9
8	1	6	7	3	2	9	5	4
4	7	9	1	5	6	2	3	8
5	3	2	4	8	9	6	7	1

Calculus 1 Worksheet #4

Limits involving trigonometric functions: $\lim_{x\to 0}\frac{\sin(\square)}{\square}$

KNOW THE FOLLOWING THREE THEOREMS:

A. $\lim_{x\to 0}\frac{\sin\square}{\square}=1$	B. $\lim_{x\to 0}\frac{\square}{\sin\square}=1$	C. $\lim_{x\to 0}\frac{1-\cos\square}{\square}=0$

Examples:

1. $\lim_{x\to 0}\frac{\sin 3x}{x} \Rightarrow \lim_{x\to 0}\frac{\sin 3x}{x}\bullet\left[\frac{3}{3}\right] \Rightarrow \lim_{x\to 0}3\left[\frac{\sin 3x}{3x}\right]=\boxed{\boxed{3}}$

2. $\lim_{x\to 0}\frac{1-\cos 7x}{x} \Rightarrow \lim_{x\to 0}\frac{1-\cos 7x}{x}\bullet\left[\frac{7}{7}\right] \Rightarrow \lim_{x\to 0}7\left[\frac{1-\cos 7x}{7x}\right]=\boxed{\boxed{0}}$

3. $\lim_{x\to 0}\frac{\tan 2x}{x} \Rightarrow \lim_{x\to 0}\frac{\frac{\sin 2x}{\cos 2x}}{x} \Rightarrow \lim_{x\to 0}\frac{\sin 2x}{x\cos 2x} \Rightarrow \lim_{x\to 0}\frac{\sin 2x}{x\cos 2x}\bullet\left[\frac{2}{2}\right] \Rightarrow$

$\lim_{x\to 0}\frac{2}{\cos 2x}\left[\frac{\sin 2x}{2x}\right] \Rightarrow \lim_{x\to 0}\frac{2}{\cos 2x} \Rightarrow \lim_{x\to 0}\frac{2}{\cos 2(0)}=\boxed{\boxed{2}}$

Problems:

1. $\lim_{x\to 0}\frac{\sin\frac{1}{2}x}{x}$	2. $\lim_{x\to 0} x\csc x$	3. $\lim_{x\to 0}\frac{\sin 2x}{\sin x}$	4. $\lim_{x\to 0}\frac{\sin ax}{x}, a\neq 0$
5. $\lim_{x\to 0}\frac{\tan x}{x}$	6. $\lim_{x\to 0}\frac{\sin 3x}{\sin 2x}$	7. $\lim_{x\to 0}\frac{\sin 3x}{x}$	8. $\lim_{x\to 0}\frac{\sin x}{2x}$
9. $\lim_{x\to 0}\frac{3\sin x}{x}$	10. $\lim_{x\to 0}\frac{\sin 3x}{5x}$	11. $\lim_{x\to 0}\frac{\sin 4x}{2x}$	12. $\lim_{x\to 0}\frac{3x}{\sin x}$
13. $\lim_{x\to 0}\frac{\sin^2 x}{x}$	14. $\lim_{x\to 0}\frac{\sin ax}{\sin bx}$	15. $\lim_{x\to 0}\frac{\sin^4 2x}{4x^4}$	16. $\lim_{x\to 0}\frac{\sin 5x}{5x}$
17. $\lim_{x\to 0}\frac{1-\cos(2x)}{2x}$	18. $\lim_{x\to 0}\frac{x+2}{\cos x}$	19. $\lim_{x\to\frac{\pi}{4}}(\tan x)$	20. $\lim_{x\to 0}\frac{1-\cos x}{\sin^2 x}$

Answers:

1) $\frac{1}{2}$	2) 1	3) 2	4) a	5) 1	6) $\frac{3}{2}$	7) 3	8) $\frac{1}{2}$
9) 3	10) $\frac{3}{5}$	11) 2	12) 3	13) 0	14) $\frac{a}{b}$	15) 4	16)1
17) 0	18) 2	19) 1	20) $\frac{1}{2}$				

Revised: 8/24/2010