WS_Limits Algebraically 4.1 Calculus Name Key
Date _____ Bell ____

Evaluate the following limits. **Must show work!** Reduce answer when possible. Remember to write the limit notation as you work.

1. $\lim_{x \to 3} \frac{x-3}{x^3-27} = \frac{1}{27}$

$f(3) = \frac{0}{0}$ Indeterminate

$\lim_{x\to 3} \frac{(x-3)}{(x-3)(x^2+3x+9)}$

$\lim_{x\to 3} \frac{1}{x^2+3x+9} = \frac{1}{3^2+3(3)+9} = \frac{1}{27}$

2. $\lim_{x \to 3} \frac{\frac{1}{x}+\frac{1}{3}}{x-3} =$ DNE

$\frac{(3x)\frac{1}{x} + \frac{1}{3}(3x)}{(x-3)(3x)}$

$\frac{3+x}{(x-3)(3x)}$

$f(3) = \frac{\frac{1}{3}+\frac{1}{3}}{3-3} = \frac{\frac{2}{3}}{0}$

Test pts

$x = 2.99$	3.01
$+$	$+$
$-\infty$	$+\infty$

3. $\lim_{x \to -4} \frac{\frac{1}{4}-\frac{1}{x}}{4+x} =$ DNE

$\frac{\frac{1}{4}-\left(\frac{1}{-4}\right)}{4+(-4)} = \frac{\frac{1}{2}}{0}$ $\frac{\left(\frac{1}{4}-\frac{1}{x}\right)(4x)}{4+x\,(4x)}$

$\frac{x-4}{4x(x+4)}$

$x =$	
-4.01	-3.99
$-$	$-$
$(-)(-)$	$(-)(+)$
$-\infty$	$+\infty$

4. $\lim_{x \to -2} \frac{x^2-4}{x^2-6x-16} = \frac{2}{5}$

$f(-2) = \frac{(-2)^2-4}{(-2)^2-6(-2)-16} = \frac{0}{0}$

$\frac{(x+2)(x-2)}{(x-8)(x+2)}$

$\lim_{x\to -2} \frac{x-2}{x-8} = \frac{-2-2}{-2-8} = \frac{-4}{-10} = \frac{2}{5}$

5. $\lim_{x \to 16} \frac{\sqrt{x}-4}{x-16} = \frac{1}{8}$

$f(16) = \frac{\sqrt{16}-4}{16-16} = \frac{0}{0}$

$\lim_{x\to 16} \frac{\sqrt{x}-4}{x-16} \cdot \frac{\sqrt{x}+4}{\sqrt{x}+4}$

$\lim_{x\to 16} \frac{x-16}{(x-16)(\sqrt{x}+4)} = \frac{1}{\sqrt{16}+4} = \frac{1}{4+4}$

6. $\lim_{x \to 0} \frac{x}{\sqrt{x+9}-3} = 6$

$f(0) = \frac{0}{\sqrt{9}-3}$ $\frac{0}{0}$

$\lim_{x\to 0} \frac{x}{\sqrt{x+9}-3} \cdot \frac{\sqrt{x+9}+3}{\sqrt{x+9}+3}$

$\lim_{x\to 0} \frac{x(\sqrt{x+9}+3)}{x+9-9} = \lim_{x\to 0} \sqrt{x+9}+3$

$\sqrt{0+9}+3$

Without Graphing Evaluate Given:

$$g(x) = \begin{cases} |x| & , x \le -1 \\ 2x-1 & , -1 < x \le 1 \\ x^2 & , x > 1 \end{cases}$$

7. $\lim_{x\to 1^+} g(x) = 1^2$ 1

8. $\lim_{x\to 1^-} g(x)$ 1

$2(1)-1$

9. $\lim_{x\to 1} g(x)$ 1

10. $\lim_{x\to 5} g(x)$ 25

5^2

11. $\lim_{x\to -1^+} g(x)$ $2(-1)-1$ -3

12. $\lim_{x\to -1^-} g(x)$ $|-1| = 1$

13. $\lim_{x\to -1} g(x)$ DNE

$\lim_{x\to -1^+} g(x) \neq \lim_{x\to -1^-} g(x)$

14. $\lim_{x\to 0} g(x)$ $2(0)-1$ -1