Name: _________________________ Date: ___________________

Learning Goal 2.1	Finite limits and continuity.

More Questions

1. The Heavyside function H is a simple switch equation defined by
$$H(t) = \begin{cases} 0, t < 0 \\ 1, t \geq 0 \end{cases}$$
Find the limit as $t \to 0$ from both sides.
$$\lim_{t \to 0^-} H(t) = 0 \qquad \lim_{t \to 0^+} H(t) = 1$$
So the limit as t approaches 0 doesn't exist. This is a super boring example, and yet the Heavyside function comes up in random places … I wanted y'all to have a heads up!

2. The graph of a function g is shown. Use it to state the following values (if they exist).

a. $\lim_{x \to 2^-} g(x) = 3$

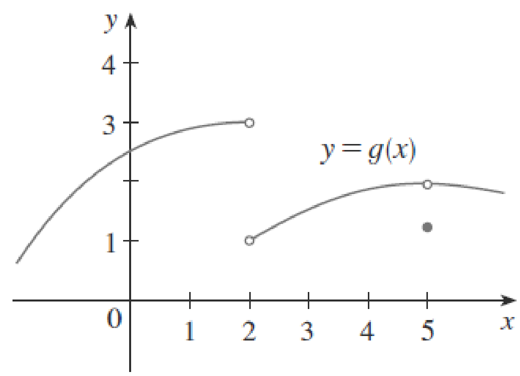
b. $\lim_{x \to 2^+} g(x) = 1$

c. $\lim_{x \to 2} g(x) = \text{DNE}$

a. $\lim_{x \to 5^-} g(x) = 2$

b. $\lim_{x \to 5^+} g(x) = 2$

c. $\lim_{x \to 5} g(x) = 2$



3. Find each limit.

a. $\lim_{x \to 0} \frac{1}{x^2} = \infty$

x	$f(x)$
-0.01	$10\ 000$
-0.001	$1\ 000\ 000$
-0.0001	$100\ 000\ 000$
0	$-$
0.0001	$100\ 000\ 000$
0.001	$1\ 000\ 000$
0.01	$10\ 000$

b. $\lim_{x \to \frac{\pi}{2}} \tan x$

$$\tan x = \frac{\sin x}{\cos x}$$

$$\lim_{x \to \frac{\pi}{2}} \sin x = 1$$

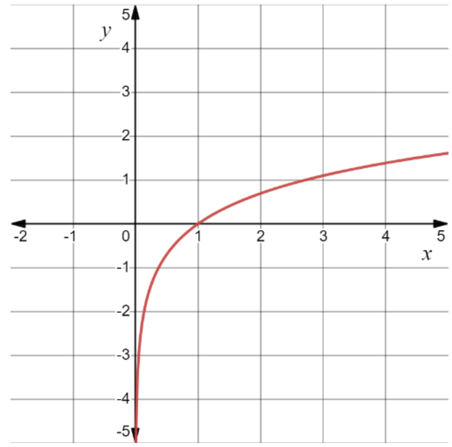
So the numerator contributes a positive sign to the limit.

x	$f(x)$
$\frac{\pi}{2} - 0.001$	0.00100
$\frac{\pi}{2} - 0.0001$	0.00010
0	$-$
$\frac{\pi}{2} + 0.0001$	-0.00010
$\frac{\pi}{2} + 0.001$	-0.00100

$$\lim_{x \to \frac{\pi}{2}^-} \tan x = \frac{1}{\text{small} + \text{ve}}$$
$$= \infty$$

$$\lim_{x \to \frac{\pi}{2}^+} \tan x = \frac{1}{\text{small} - \text{ve}}$$
$$= -\infty$$

c. $\lim_{x \to 0} \ln x$



$$\lim_{x \to 0^-} \ln x = \text{DNE}$$
$$\lim_{x \to 0^+} \ln x = -\infty$$
$$\lim_{x \to 0} \ln x = \text{DNE}$$

4. For each function, sketch the graph of the function. Determine the indicated limit, if it exists.

a. $f(x) = \begin{cases} x + 2, x < -1 \\ -x + 2, x \geq -1 \end{cases}$ $\lim_{x \to -1} f(x)$

$\lim_{x \to -1^-} f(x)$
$= \lim_{x \to -1^-} x + 2$
$= -1 + 2$
$= 1$

$\lim_{x \to -1^+} f(x)$
$= \lim_{x \to -1^+} -x + 2$
$= -(-1) + 2$
$= 3$

$\lim_{x \to -1} f(x) = \text{DNE}$

b. $f(x) = \begin{cases} -x + 4, x \leq 2 \\ -2x + 6, x > 2 \end{cases}$ $\lim_{x \to 2} f(x)$

$\lim_{x \to 2^-} f(x)$
$= \lim_{x \to 2^-} -x + 4$
$= -(2) + 4$
$= 2$

$\lim_{x \to 2^+} f(x)$
$= \lim_{x \to 2^+} -2x + 6$
$= -2(2) + 6$
$= 2$

$\lim_{x \to -1} f(x) = 2$

c. $f(x) = \begin{cases} 4x, x \geq \frac{1}{2} \\ \frac{1}{x}, x < \frac{1}{2} \end{cases}$ $\lim_{x \to \frac{1}{2}} f(x)$

$\lim_{x \to \frac{1}{2}^-} f(x)$
$= \lim_{x \to \frac{1}{2}^-} \frac{1}{x}$
$= \frac{1}{1/2}$
$= 2$

$\lim_{x \to \frac{1}{2}^+} f(x)$
$= \lim_{x \to \frac{1}{2}^+} 4x$
$= 4\left(\frac{1}{2}\right)$
$= 2$

$\lim_{x \to \frac{1}{2}} f(x) = 2$

d. $f(x) = \begin{cases} 1, x < -0.5 \\ x^2 - 0.25, x \geq -0.5 \end{cases}$ $\lim_{x \to -0.5} f(x)$

$\lim_{x \to -0.5^-} f(x)$
$= \lim_{x \to -0.5^-} 1$
$= 1$

$\lim_{x \to -0.5^+} f(x)$
$= \lim_{x \to -0.5^+} x^2 - 0.25$
$= (-0.5)^2 - 0.25$
$= 0$

$\lim_{x \to -0.5} f(x) = \text{DNE}$

Assignment # 11 – 14, 23 – 37 Quiz Next Day!