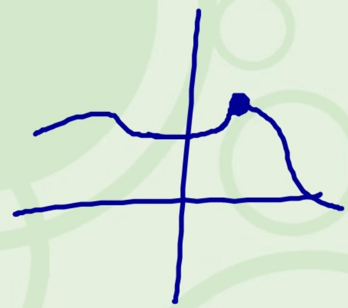
JANUARY 22

Using limits, how can you determine if a function continuous?

$$f(x)=\begin{cases} 2x, & x \le 1 \\ x^2+c, & x>1 \end{cases}$$



$$f(x)=\begin{cases} 2x, & x \le 1 \\ x^2+1, & x>1 \end{cases}$$

$$\left.\begin{aligned} \lim_{x\to 1^-} f(x) &= \lim_{x\to 1^-} 2x = 2(1) = 2 \\ \lim_{x\to 1^+} f(x) &= \lim_{x\to 1^+} x^2+1 = 1^2+1 = 2 \end{aligned}\right\} \lim_{x\to 1} f(x) = 2$$

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

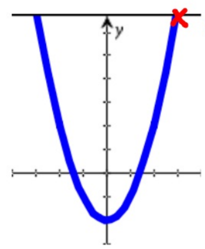
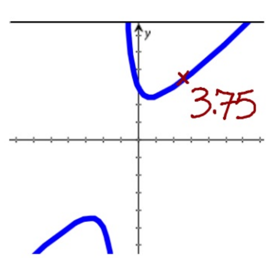
<u>Continuous</u>

JANUARY 22

Students will verbally explain how to find the limit algebraically

(using the words: right, left, closer...)

<table>
<tr><th>Limit</th><th>Numerical</th><th>Graphical</th><th>Algebraic</th></tr>
<tr>
<td>$\lim_{x\to3} x^2-2$

7</td>
<td>
<table>
<tr><th>x</th><th>f(x)</th></tr>
<tr><td>3.002</td><td>7.012004</td></tr>
<tr><td>3.001</td><td>7.006001</td></tr>
<tr><td>3.0005</td><td>7.003</td></tr>
<tr><td>3.00001</td><td>7.00006</td></tr>
</table>
7
<table>
<tr><th>x</th><th>f(x)</th></tr>
<tr><td>2.998</td><td>6.988004</td></tr>
<tr><td>2.999</td><td>6.994001</td></tr>
<tr><td>2.9995</td><td>6.997</td></tr>
<tr><td>2.99999</td><td>6.99994</td></tr>
</table>
</td>
<td>
7</td>
<td>$\lim_{x\to3} x^2-2 =$
$(3)^2-2 =$
$9-2=7$</td>
</tr>
<tr>
<td>$\lim_{x\to3}\frac{x^3-2x^2-9}{x^2-2x-3}$</td>
<td>
<table>
<tr><th>x</th><th>f(x)</th></tr>
<tr><td>3.002</td><td>3.751625</td></tr>
<tr><td>3.001</td><td>3.750813</td></tr>
<tr><td>3.0005</td><td>3.750406</td></tr>
<tr><td>3.00001</td><td>3.750008</td></tr>
</table>
<table>
<tr><th>x</th><th>f(x)</th></tr>
<tr><td>2.998</td><td>3.748375</td></tr>
<tr><td>2.999</td><td>3.749188</td></tr>
<tr><td>2.9995</td><td>3.749594</td></tr>
<tr><td>2.99999</td><td>3.749992</td></tr>
</table>
3.75
</td>
<td>
3.75</td>
<td>$\lim_{x\to3}\frac{x^3-2x^2-9}{x^2-2x-3}$
$=\frac{(3)^3-2(3)^2-9}{(3)^2-2(3)-3}$
$=\frac{0}{0}$
Indeterminate</td>
</tr>
</table>

Period 1

$\lim_{x\to 9} 12+\sqrt{x}$

$= 12+\sqrt{9}$

$= 12+3 = 15$

$\lim_{x\to 3} x^3+5$

$= (3)^3+5$

$= 27+5 = 32$

$\frac{0}{K} = 0 \quad \frac{N}{0} = \text{und.}$

$\lim_{x\to 4} \frac{7x-3}{2x^2-32}$

$= \frac{7(4)-3}{2(4)^2-32}$

$= \frac{28-3}{2(16)-32} = \frac{25}{0}$

undefined

$\lim_{x\to 2} \frac{x^2+x-6}{x^3+1}$

$= \frac{(2)^2+(2)-6}{(2)^3+1}$

$= \frac{4+2-6}{8+1} = \frac{0}{9} = 0$

Period 2

$\lim_{x\to 16} 5+\sqrt{x}$

$= 5+\sqrt{16}$

$= 5+4 = 9$

$\lim_{x\to 2} x^3+1$

$= (2)^3+1$

$= 8+1 = 9$

$\frac{0}{K} = 0$

$\frac{N}{0} = \text{undef.}$

$\lim_{x\to 3} \frac{36-4x^2}{2x+10}$

$= \frac{36-4(3)^2}{2(3)+10}$

$= \frac{36-36}{6+10} = \frac{0}{16} = 0$

$\lim_{x\to -1} \frac{4x-3}{x^2-2x-3}$

$= \frac{4(-1)-3}{(-1)^2-2(-1)-3}$

$= \frac{-4-3}{1+2-3} = \frac{-7}{0}$

undefined

Period 7

$$\lim_{x\to 2} \frac{4x-1}{x^2+x-6} = \frac{4(2)-1}{(2)^2+(2)-6} = \frac{8-1}{4+2-6} = \frac{7}{0}$$

undefined

$\frac{N}{0}$ = undef.

$\frac{0}{K} = 0$

$\frac{0}{0}$ = indeterminate

$$\lim_{x\to 8} \sqrt[3]{x} + 20 = \sqrt[3]{8} + 20$$

$$= 2 + 20 = 22$$

$$\lim_{x\to 7} \sqrt[4]{x^3} - 2 = \sqrt[4]{7^3} - 2$$

$$= 7^{3/4} - 2 = 2.303$$

Period 1

$$f(x) = \begin{cases} x^3-2, & x \le 0 \\ 2^x, & 0 < x < 3 \\ 2x^2+1, & x \ge 3 \end{cases}$$

use first equation because $-1 \le 0$

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

$$\lim_{x\to 10} f(x) = \lim_{x\to 10} 2x^2+1 = 2(10)^2+1 = 2(100)+1 = 201$$

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

Period 2

$$f(x)=\begin{cases} x^2-4, & x\le -1 \\ 2x+3, & -1<x\le 1 \\ 2^x-1, & x>1 \end{cases}$$

use 2nd equation because 0 is between -1 and 1

$$\lim_{x\to 0} f(x) = \lim_{x\to 0} 2x+3 = 2(0)+3=3$$

$$\lim_{x\to -3} f(x) = \lim_{x\to -3} x^2-4=(-3)^2-4=5$$

$$\lim_{x\to 5} f(x) = \lim_{x\to 5} 2^x-1 = 2^5-1=32-1=31$$

Period 7

$$f(x)=\begin{cases} 2^x+1, & x<1 \\ 3x-4, & 1\le x<2 \\ \dfrac{2x^2-18}{4x+1}, & x\ge 2 \end{cases}$$

$$\lim_{x\to 0} f(x) = \lim_{x\to 0} 2^x+1 = 2^0+1 = 1+1=2$$

$$\lim_{x\to 3} f(x) = \lim_{x\to 3} \frac{2x^2-18}{4x+1} = \frac{2(3)^2-18}{4(3)+1} = \frac{0}{13} = 0$$

$$\lim_{x\to 1^+} f(x) = \lim_{x\to 1^+} 3x-4 = 3(1)-4=-1$$

Practice Problems

			Test #/Date
Set #1			
Pg 89 #51-54	....	Graphing Piecewise Functions	1/Jan 30
57-59	....	finding continuous functions	
Set #2			
Pg 74 #1-6, 17-27 (odd)	....	finding limits numerically	1/Jan 30
49-53	....	sketching functions	
Pg 89 #63, 65	....	sketching function	
Set #3			
Pg 80 #1-23 (odd)	....	finding limits algebraically	1/Jan 30
26-30	....	basic limit laws	
Set #4			
Pg 89 #67-80	....	finding limits algebraically	
Pg 94 #5-25(odd)	....	vertical asymptotes	
45-54	....	finding limits in terms of *a*	______