JANUARY 17

What is the difference between
the three types of discontinuities:
Jump
Removable
Infinite

JANUARY 17

Students will verbally explain how to
find the limit numerically
(using the words:
right, left, closer...)

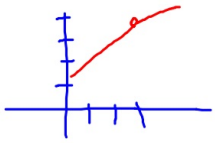
$$\lim_{x\to 3}\frac{x^3-2x^2-9}{x^2-2x-3}=3.75$$

x	f(x)
3.002	3.751625
3.001	3.750813
3.0005	3.750406
3.00001	3.750008

$\lim_{x\to 3^+} f(x)=3.75$

x	f(x)
2.998	3.748375
2.999	3.749188
2.9995	3.749594
2.99999	3.749992

$\lim_{x\to 3^-} f(x)=3.75$



Removable

$\lim_{x\to 3^+} f(x)=\lim_{x\to 3^-} f(x)=3.75\neq f(3)$

$$\lim_{x\to 3}\frac{5}{x-3}=\text{DNE}$$

x	f(x)
3.002	2500
3.001	5000
3.0005	10000
3.00001	500000

$\lim_{x\to 3^+} f(x)=\infty$

x	f(x)
2.998	-2500
2.999	-5000
2.9995	-10000
2.99999	-500000

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

Infinite

$$\lim_{x\to 3} x^2-2=7$$

x	f(x)
3.002	7.012004
3.001	7.006001
3.0005	7.003
3.00001	7.00006

$\lim_{x\to 3^+} f(x)=7$

x	f(x)
2.998	6.988004
2.999	6.994001
2.9995	6.997
2.99999	6.99994

$\lim_{x\to 3^-} f(x)=7$

Continuous

$$\lim_{x\to 3}\frac{x^3-2x^2-9}{x^2-2x-3}=3.75$$

x	f(x)
3.002	3.751625
3.001	3.750813
3.0005	3.750406
3.00001	3.750008

$\lim_{x\to 3^+} f(x)=3.75$

x	f(x)
2.998	3.748375
2.999	3.749188
2.9995	3.749594
2.99999	3.749992

$\lim_{x\to 3^-} f(x)=3.75$

$\lim_{x\to 3} f(x)=3.75$

$f(3)=$ undefined

$f(3)\neq \lim_{x\to 3} f(x)$

Removable

$$\lim_{x\to 3}\frac{5}{x-3}\ \text{DNE}$$

x	f(x)
3.002	2500
3.001	5000
3.0005	10000
3.00001	500000

$\lim_{x\to 3^+} f(x)=\infty$

x	f(x)
2.998	-2500
2.999	-5000
2.9995	-10000
2.99999	-500000

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

Infinite Discontinuity

$$\lim_{x\to 3} x^2-2=7$$

x	f(x)
3.002	7.012004
3.001	7.006001
3.0005	7.003
3.00001	7.00006

$\lim_{x\to 3^+} f(x)=7$

x	f(x)
2.998	6.988004
2.999	6.994001
2.9995	6.997
2.99999	6.99994

$\lim_{x\to 3^-} f(x)=7$

$f(3)=7=\lim_{x\to 3} f(x)$

Continuous

$\lim_{x\to 3} \dfrac{x^3-2x^2-9}{x^2-2x-3} = 3.75$

x	f(x)
2.998	3.748375
2.999	3.749188
2.9995	3.749594
2.99999	3.749992

$\lim_{x\to 3^-} f(x) = 3.75$

x	f(x)
3.002	3.751625
3.001	3.750813
3.0005	3.750406
3.00001	3.750008

$\lim_{x\to 3^+} f(x) = 3.75$

$\lim_{x\to 3^-} f(x) = \lim_{x\to 3^+} f(x) = 3.75$

$\lim_{x\to 3} f(x) = 3.75$

$f(3)$ is undefined

Removable discontinuity at $x=3$

$\lim_{x\to 3} \dfrac{5}{x-3}$ DNE

x	f(x)
2.998	-2500
2.999	-5000
2.9995	-10000
2.99999	-500000

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

x	f(x)
3.002	2500
3.001	5000
3.0005	10000
3.00001	500000

$\lim_{x\to 3^+} f(x) = \infty$

Infinite Discontinuity at $x=3$

$\lim_{x\to 3} x^2 - 2 = 7$

x	f(x)
2.998	6.988004
2.999	6.994001
2.9995	6.997
2.99999	6.99994

$\lim_{x\to 3^-} f(x) = 7$

x	f(x)
3.002	7.012004
3.001	7.006001
3.0005	7.003
3.00001	7.00006

$\lim_{x\to 3^+} f(x) = 7$

$f(3) = 3^2 - 2 = 7$

$\lim_{x\to 3} f(x) = 7 = f(3)$

Continuous at $x=3$

estimate the limit numerically

$\lim_{x\to 1^-} \dfrac{3-x}{x-1}$

$\lim_{x\to 1^-} \dfrac{3-x}{x-1} = -\infty$

x	f(x)
-2	-1.6667
.99	-201
.999	-2001
.9999	-20001

$\lim_{x\to -4} \dfrac{2x^2-32}{x+4}$

$\lim_{x\to -4^-} \dfrac{2x^2-32}{x+4}$

x	f(x)
-6	-20
-5	-18
-4.5	-17
-4.25	-16.48

$\lim_{x\to -4^+} \dfrac{2x^2-32}{x+4}$

x	f(x)
-3	-14
-3.5	-15
-3.9	-15.8
-3.99	-15.98

$\lim_{x\to -4} \dfrac{2x^2-32}{x+4} = -16$

estimate the limit numerically

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

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

x	f(x)
0	-3
.5	-5
.95	-41
.99	-201

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

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

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

x	f(x)
-5	-18
-4.9	-17.8
-4.5	-17
-4.01	-16.02

$\lim_{x\to -4^-} f(x) = -16$

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

x	f(x)
-2	-12
-3	-14
-3.5	-15
-3.9	-15.8

$\lim_{x\to -4^+} f(x) = -16$

$\lim_{x\to -4} f(x) = -16$

estimate the limit numerically

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

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

x	f(x)
-5	-18
-4.5	-17
-4.4	-16.8
-4.3	-16.6
-4.01	-16.02

$\lim_{x\to -4^-} \frac{2x^2-32}{x+4} = -16$

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

x	f(x)
-1	-10
-3	-14
-3.9	-15.8
-3.95	-15.9
-3.99	-15.98

$\lim_{x\to -4^+} \frac{2x^2-32}{x+4} = -16$

$\lim_{x\to -4} f(x) = -16$

Assignment #1
pg 88 #51-54, 57-59, 63, 65

Assignment #2
pg 74 #1-6, 17-27 (odd), 49-53