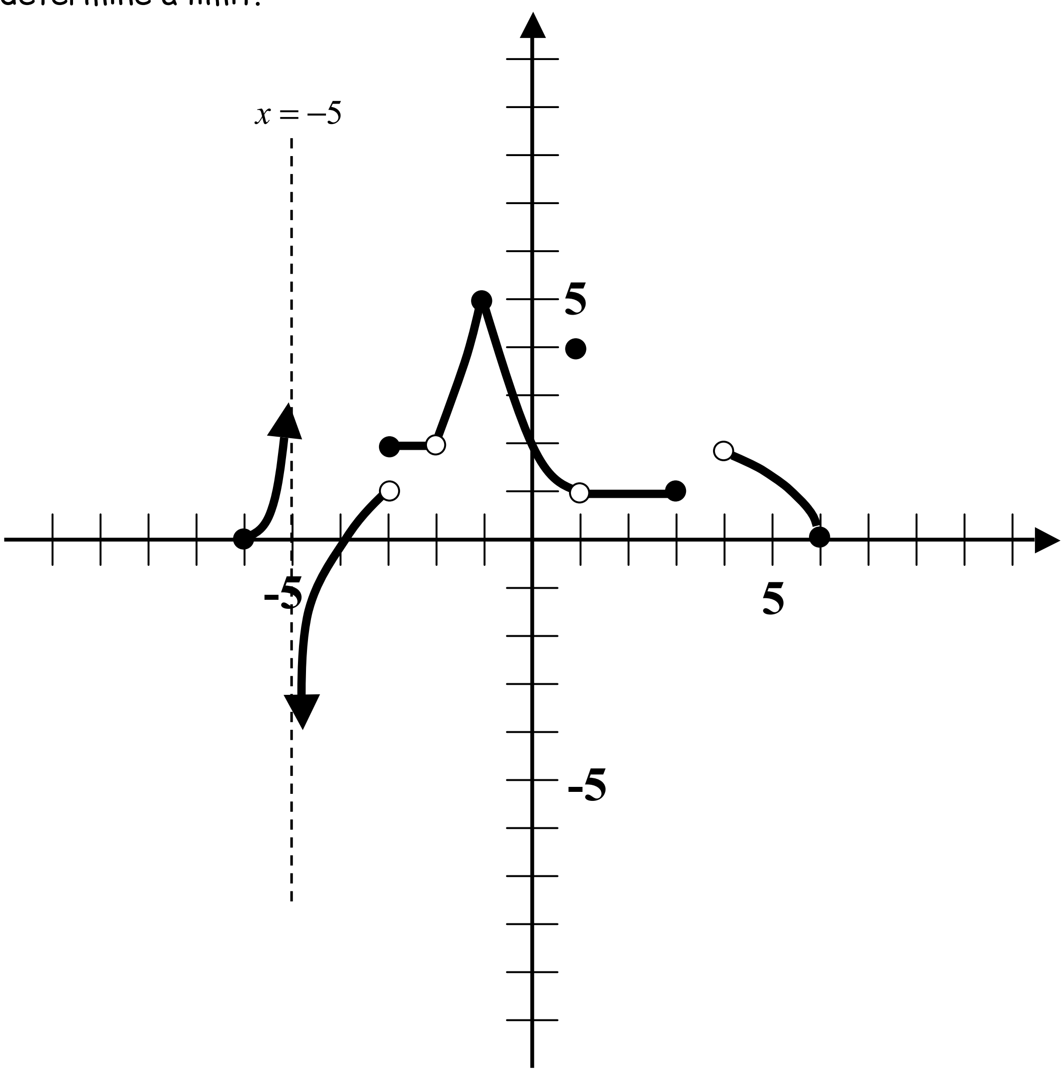
The Limit of a Function

-Limits will set the stage for the first real "calculus" part of the course.
-Limits will need to be evaluated intuitively, analytically and graphically.
-No formal definition will be used to define a limit at the point.

Limits by Graphing

-Because limits are intuitive, one of the first tools that we can use is a graph to determine a limit.



-We can use a graph to view where a function is APPROACHING!

-We are not concerned with where a function is defined but where it is approaching a value.

-Looking at the graphs we can trace the function with a left and right finger and see what value is being approached.

Notation

-The notation

$$\lim_{x \to c} f\left(x\right) = L$$

is read "the limit of f of x as x approaches c is L"

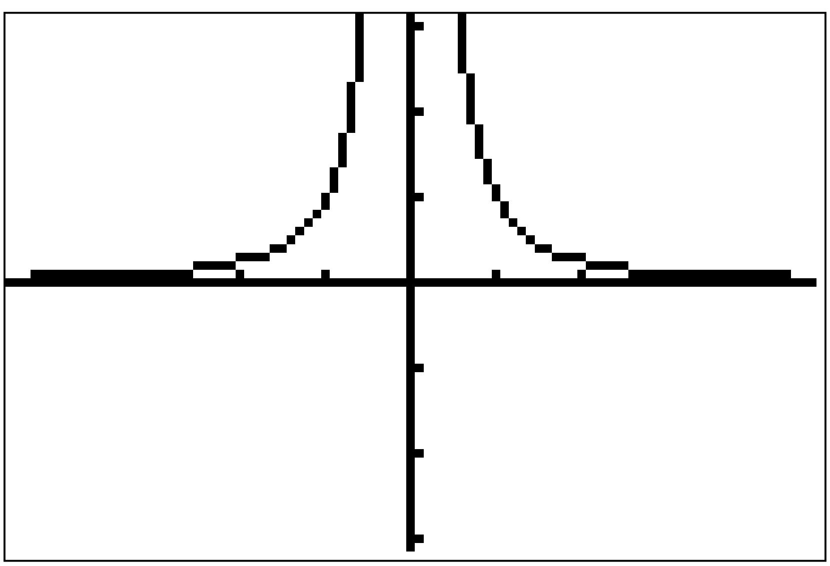
-If the limit approaches a value L from both sides we say the limit <u>converges</u> to the value L.

Limits that doe not exist

-Sometimes when evaluating a limit you will find that the value as x → c will not be finite.

-If $\lim_{x \to c} f\left(x\right)$ fails to exist we say that $f\left(x\right)$ <u>diverges</u> *as x→c.*

$$f\left(x\right) = \frac{1}{x^2}$$



$\lim_{x \to 0} f\left(x\right)$ increases without bound and is said to diverge

-Using the graphing calculus we can look at a table of values to observe the behavior of the function.

-Observe the function $f\left(x\right)=\dfrac{1}{x^2}$

-Using the **tblset** feature we can change where the values tart and how fast they change $\left(\Delta x\right)$

-Start with $Tblstart = 0,\ \Delta Tbl = 0.5$

-0 yields an error (the function is undefined there). However we do NOT need the function to be defined for the limit to exist.

X	Y1	
0	ERROR	
.5	4	
1	1	
1.5	.44444	
2	.25	
2.5	.16	
3	.11111	

X=0

-Change to $\Delta Tbl = 0.05$

X	Y1	
0	ERROR	
.05	400	
.1	100	
.15	44.444	
.2	25	
.25	16	
.3	11.111	

X=0

-Change to $\Delta Tbl = 0.005$

X	Y1	
0	ERROR	
.005	40000	
.01	10000	
.015	4444.4	
.02	2500	
.025	1600	
.03	1111.1	

X=0