1.2 Graphic and numeric limits

Obj: Define limits and the properties of limits; Evaluate limits graphically and numerically

On your Calculator, graph the $f(x) = \dfrac{\sin x}{x}$ and see what value does the function approach at x=0.

Is the function actually defined at x=0?

Definition of a Limit:

Numerical Limits
Find the limit.   Choose values very close to 1 on both sides.

$$\lim_{t \to 1} \frac{t^2 - 1}{t - 1}$$

Numerical limits are good for absolute Values.
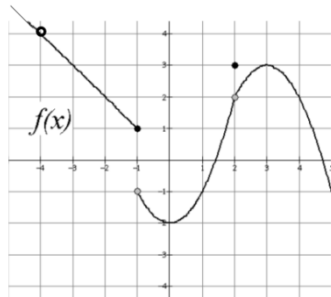You try.

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

Solving Limits graphically.
1. A "limit" is the _____ that a function approaches.

2. The function _____ at that point. It only has to approach the same value from both sides.

3. A limit can approach from the + or - side. These are _____ limits.

Solve the Limits.

Find:

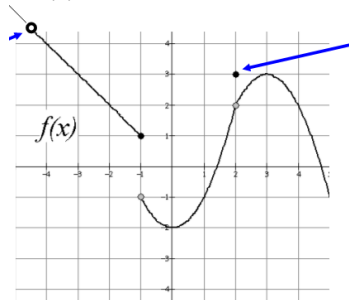$$f(2) = \qquad\qquad \lim_{x \to 3} f(x) =$$

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

The existence   or non-existence of *f(x)* as *x* approaches *c* has no bearing on the existence of the limit of *f(x)* as *x* approaches *c*.

3 Ways limits can fail to exist.

1.

2.

3.

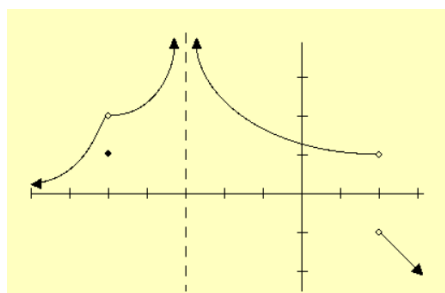<u>One-sided & Two Sided limits</u>

If   (limit from right)

And   (limit from left),   then

If the left limit≠right limit then the overall limit is DNE!

Practice.

1. $f(2)=$

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

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

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

5. $f(-5)=$

6. $\lim_{x \to -5^+} f(x)=$

7. $\lim_{x \to -5^-} f(x)=$

8. $\lim_{x \to -5} f(x)=$

9. $\lim_{x \to -3} f(x)=$

10. $\lim_{x \to -\infty} f(x)=$

11. $\lim_{x \to \infty} f(x)=$

12. $\lim_{x \to c} f(x)=$
$c \neq -3, -5, 2$

Write true or false for the following.
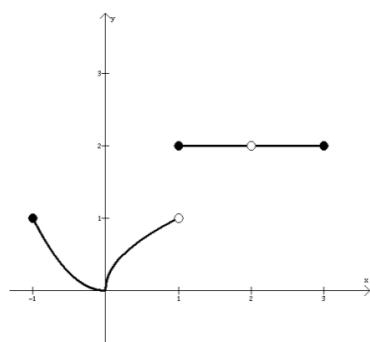
a. $\lim_{x \to -1^+} f(x)=1$

b. $\lim_{x \to 2} f(x)=DNE$

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

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

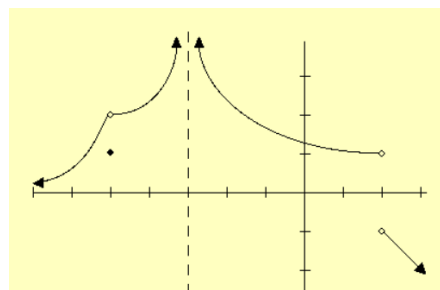e. $\lim_{x \to 1^+} f(x)=2$

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

g. $\lim_{x \to 0^+} f(x)=\lim_{x \to 0^-} f(x)$

Composition of limits

f(x)

g(x)

$\lim_{x \to -5} f(g(x))$

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

$\lim_{x \to 2} g(f(x))$