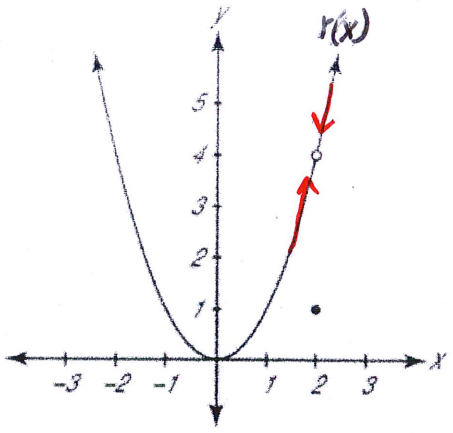
Key

Calculus AB Ch. 1.2 Notes on Limits

Definition: **The Limit** is the y-value that a function or graph approaches as the x-value moves closer to a given constant

Function Value is finding the location of the y-value of the graph at a specific x-value.

Example 1:



* The y-value of the graph when x =2 is 1"

Notation: $r(2)=1$

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* "The Limit of r(x) as x approaches 2 is 4 "

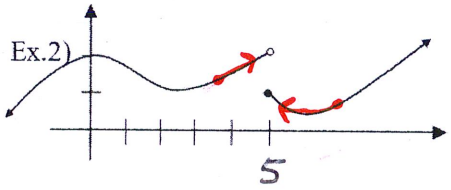
Notation: $\lim_{x\to 2} r(x) = 4$ ~~$\lim_{x\to 2} = 4$~~

*watch notation

*In order for a limit to exist, the graph MUST approach the same **Real Number** y-value from both sides of the target x-value constant.

Examples where the Limit does not exist:

Ex.2)

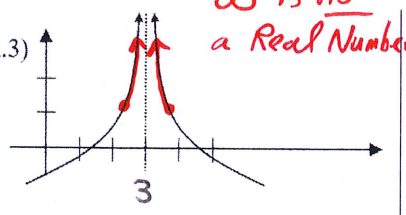


*Jump discontinuity

Example 2:

$\lim_{x\to 5} f(x) =$ d.n.e.
(does not exist)

Ex.3)

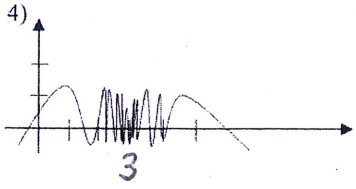


∞ is not a Real Number

*Vertical Asymptote

Example 3: $\lim_{x\to 3} f(x) =$ d.n.e. $(+\infty)$

Ex. 4)



*Graphs with oscillating behavior

Example 4: $\lim_{x\to 3} \sin\left(\frac{1}{x}\right) =$ d.n.e.

*If there is some sort of break in the graph, the limit and function value will always be different from each other.

Example 5: Find the limit using a table of values given that $f(x) = \frac{x^3-1}{x-1}$

x	0.9	.99	.999	1	1.0001	1.001	1.01	1.1
f(x)	2.71	2.97	2.997	Undefined	3.0003	3.003	3.03	3.31

Approaches 3 ← Approaches 3

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

However, f(1) = undefined

Calculus Ch. 1.2 Classwork Problems **Evaluating Limits Graphically** Key

*Does Not Exist (dne)

1) $\lim_{x \to -5} f(x) =$ d.n.e.

2) $\lim_{x \to -4} f(x) =$ 1

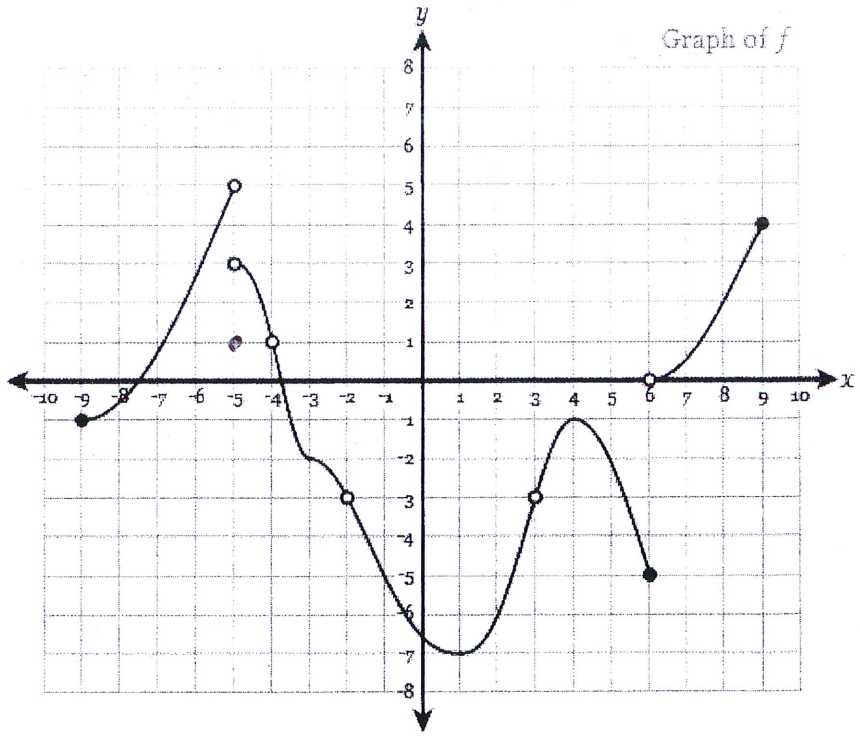
3) $f(-3) =$ -2

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

5) $f(3) =$ undefined

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

7) $\lim_{x \to 6} f(x) =$ dne.



8) $\lim_{x \to -8} f(x) =$ 1

9) $\lim_{x \to -7} f(x) =$ dne.

10) $f(-3) =$ -3

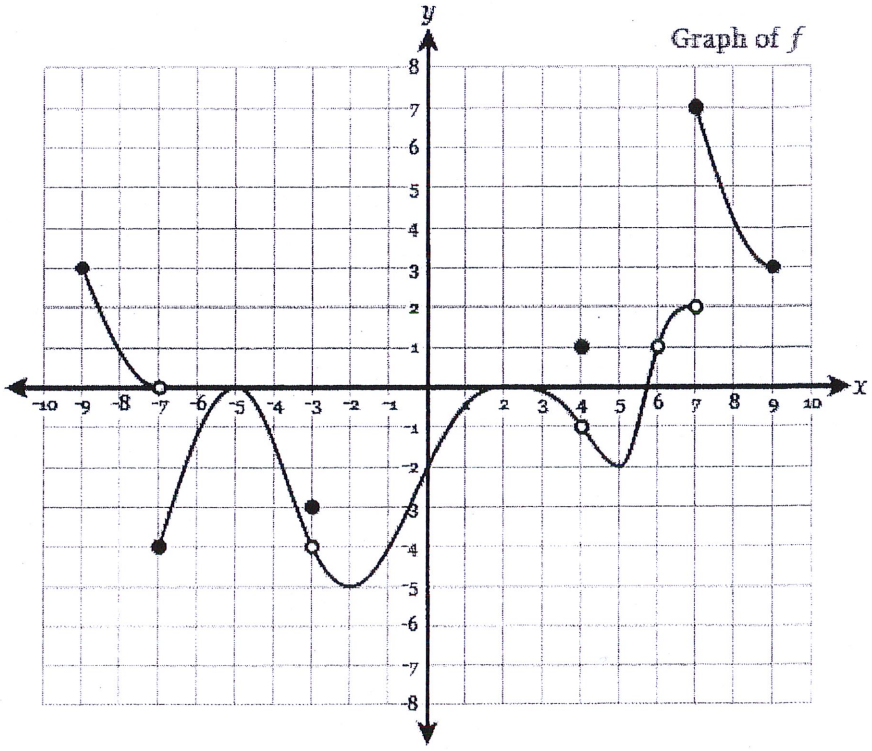
11) $\lim_{x \to 4} f(x) =$ -1

12) $f(4) =$ 1

13) $f(6) =$ d.n.e (undefined)

14) $\lim_{x \to 6} f(x) =$ 1

15) $\lim_{x \to 7} f(x) =$ d.n.e.



16) $\lim_{x \to -9} f(x) =$ d.n.e.

17) $\lim_{x \to -6} f(x) =$ -5

18) $\lim_{x \to -4} f(x) =$ d.n.e. (+∞)

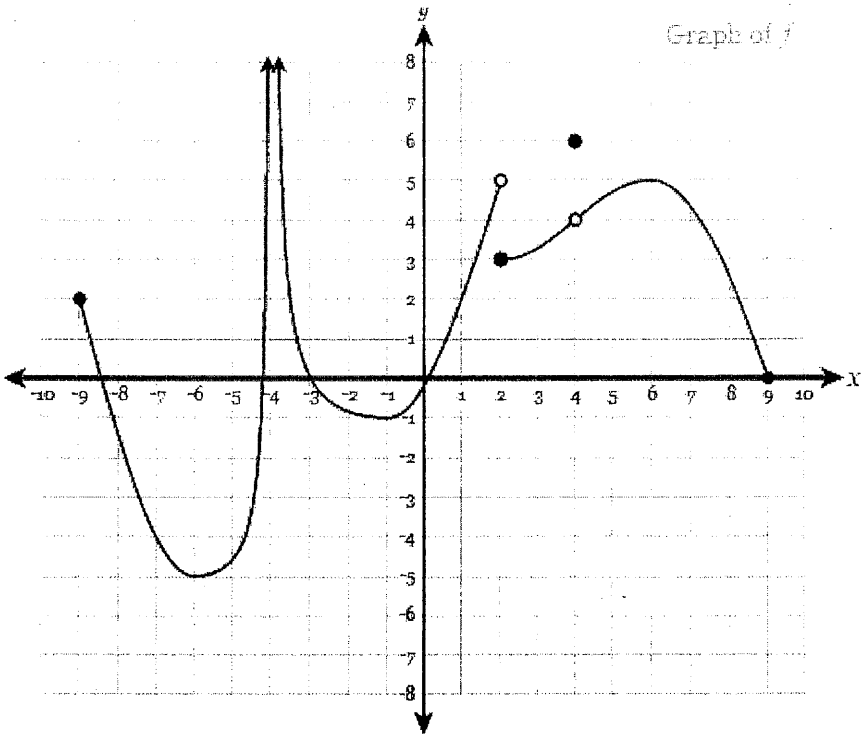
19) $f(-4) =$ undefined

20) $\lim_{x \to 2} f(x) =$ d.n.e.

21) $f(2) =$ 3

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

23) $f(4) =$ 6



24) $\lim_{x \to -6} f(x) =$ 0

25) $\lim_{x \to -4} f(x) =$ 3

26) $f(-4) =$ 2

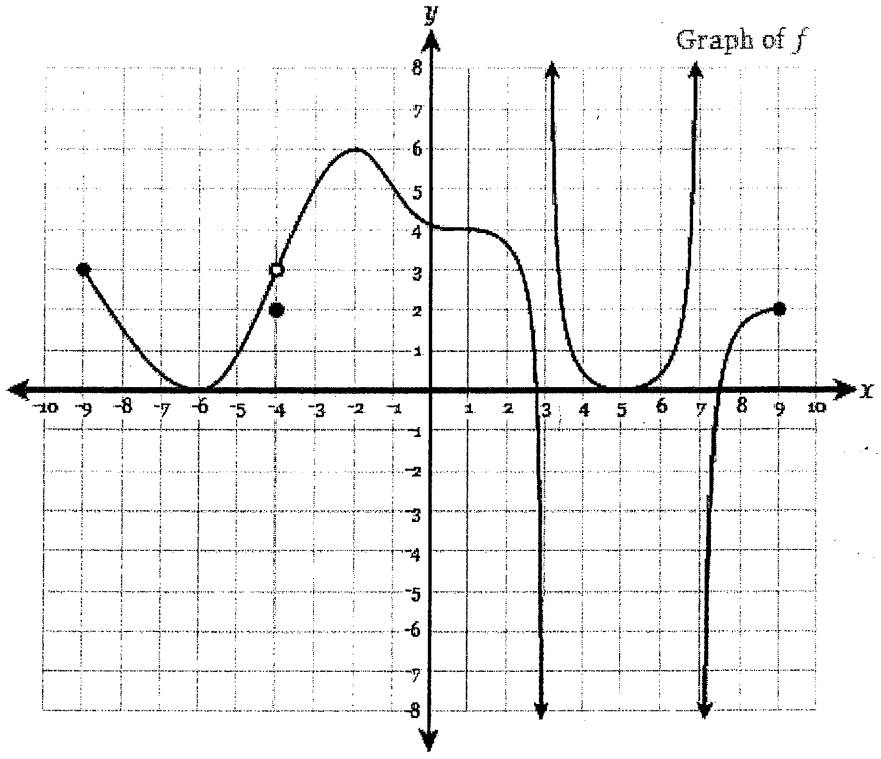
27) $f(3) =$ d.n.e

28) $\lim_{x \to 3} f(x) =$ d.n.e.

29) $\lim_{x \to 5} f(x) =$ 0

30) $\lim_{x \to 7} f(x) =$ d.n.e.

31) $\lim_{x \to 9} f(x) =$ d.n.e.



Key

Calculus Ch. 1.2 Classwork Problems Worksheet #2

Sketch graph of a function satisfying the given descriptions:

1) $\lim_{x \to -5} f(x) = 3$

2) $f(-5) = -2$

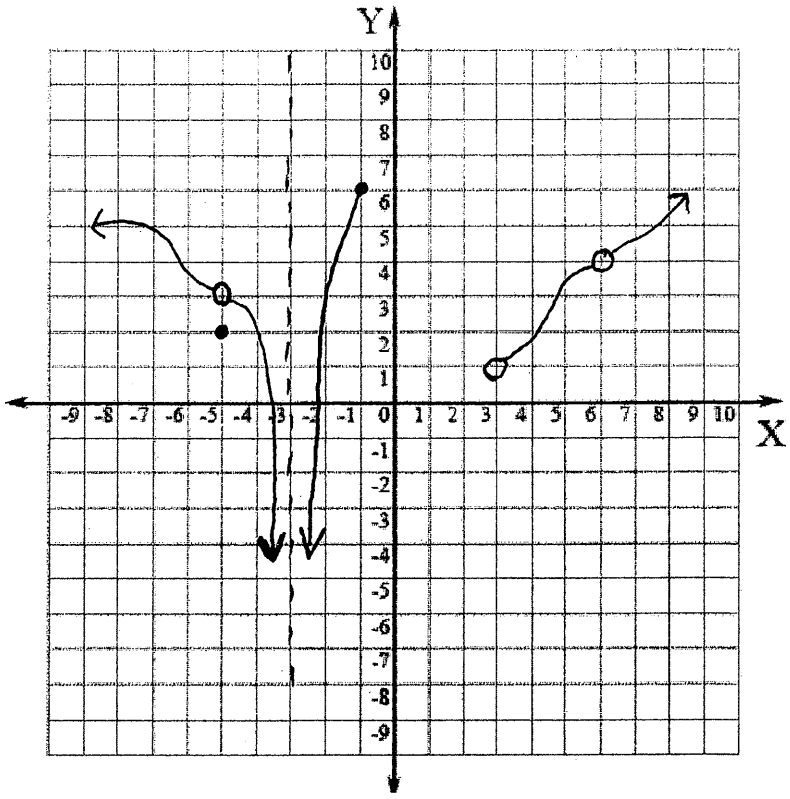
3) $f(-1) = 6$

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

5) $f(3) = undefined$

6) $\lim_{x \to 3} f(x)$ *does not exist*

7) $\lim_{x \to 6} f(x) = 4$



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

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

10) $f(-3) = 5$

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

12) $f(4) = undefined$

13) $f(6) = 4$

14) $\lim_{x \to 6} f(x) = \infty$

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