

Name: _____

Date: _____

1A Exercises

Finding Limits Graphically & Numerically

Complete the table and use the result to estimate the limit. Use a graphing utility to graph the function to confirm your result. Sketch the graph in the neighborhood of the limit point.

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

x	3.9	3.99	3.999	4.001	4.01	4.1
$f(x)$						

1.

x	3.9	3.99	3.999	4.001	4.01	4.1
$f(x)$	0.2041	0.2004	0.2000	0.2000	0.1996	0.1961

$\lim_{x \rightarrow 4} \frac{x - 4}{x^2 - 3x - 4} \approx 0.2000$ (Actual limit is $\frac{1}{5}$)

5. $\lim_{x \rightarrow 3} \frac{[1/(x + 1)] - (1/4)}{x - 3}$

x	2.9	2.99	2.999	3.001	3.01	3.1
$f(x)$						

5.

x	2.9	2.99	2.999	3.001	3.01	3.1
$f(x)$	-0.0641	-0.0627	-0.0625	-0.0625	-0.0623	-0.0610

$\lim_{x \rightarrow 3} \frac{[1/(x + 1)] - (1/4)}{x - 3} \approx -0.0625$ (Actual limit is $-\frac{1}{16}$)

7. $\lim_{x \rightarrow 0} \frac{\sin x}{x}$

x	-0.1	-0.01	-0.001	0.001	0.01	0.1
$f(x)$						

7.

x	-0.1	-0.01	-0.001	0.001	0.01	0.1
$f(x)$	0.9983	0.99998	1.0000	1.0000	0.99998	0.9983

$\lim_{x \rightarrow 0} \frac{\sin x}{x} \approx 1.0000$ (Actual limit is 1.) (Make sure you use radian mode.)

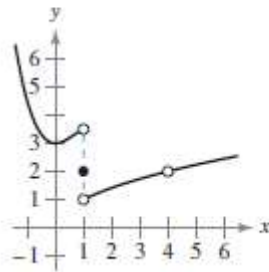
8. $\lim_{x \rightarrow 0} \frac{\cos x - 1}{x}$

x	-0.1	-0.01	-0.001	0.001	0.01	0.1
$f(x)$						

$\lim_{x \rightarrow 0} \frac{\cos x - 1}{x} \approx 0$

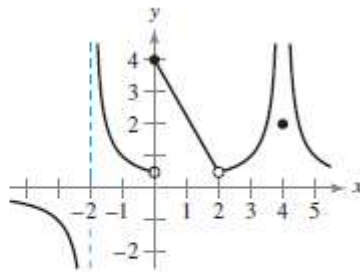
In Exercises 25 and 26, use the graph of the function f to decide whether the value of the given quantity exists. If it does, find it. If not, explain why.

25. (a) $f(1)$
 (b) $\lim_{x \rightarrow 1} f(x)$
 (c) $f(4)$
 (d) $\lim_{x \rightarrow 4} f(x)$



25. (a) $f(1)$ exists. The black dot at $(1, 2)$ indicates that $f(1) = 2$.
 (b) $\lim_{x \rightarrow 1} f(x)$ does not exist. As x approaches 1 from the left, $f(x)$ approaches 3.5, whereas as x approaches 1 from the right, $f(x)$ approaches 1.
 (c) $f(4)$ does not exist. The hollow circle at $(4, 2)$ indicates that f is not defined at 4.
 (d) $\lim_{x \rightarrow 4} f(x)$ exists. As x approaches 4, $f(x)$ approaches 2: $\lim_{x \rightarrow 4} f(x) = 2$.

26. (a) $f(-2)$
 (b) $\lim_{x \rightarrow -2} f(x)$
 (c) $f(0)$
 (d) $\lim_{x \rightarrow 0} f(x)$
 (e) $f(2)$
 (f) $\lim_{x \rightarrow 2} f(x)$
 (g) $f(4)$
 (h) $\lim_{x \rightarrow 4} f(x)$



26.
 a) $f(-2) = \text{undefined}$
 b) $\lim_{x \rightarrow -2} f(x) = \text{does not exist}$
 c) $f(0) = 4$
 d) $\lim_{x \rightarrow 0} f(x)$ does not exist because it's different from each side.
 e) $f(2) = \text{undefined}$
 f) $\lim_{x \rightarrow 2} f(x) = 1$
 g) $f(4) = 2$
 h) $\lim_{h \rightarrow 4} f(x) = \infty$

In Exercises 31 and 32, sketch a graph of a function f that satisfies the given values. (There are many correct answers)

31. $f(0)$ is undefined.
 $\lim_{x \rightarrow 0} f(x) = 4$
 $f(2) = 6$
 $\lim_{x \rightarrow 2} f(x) = 3$

32. $f(-2) = 0$
 $f(2) = 0$
 $\lim_{x \rightarrow -2} f(x) = 0$
 $\lim_{x \rightarrow 2} f(x)$ does not exist.

31. One possible answer is

