

Mini-Lecture 14.1

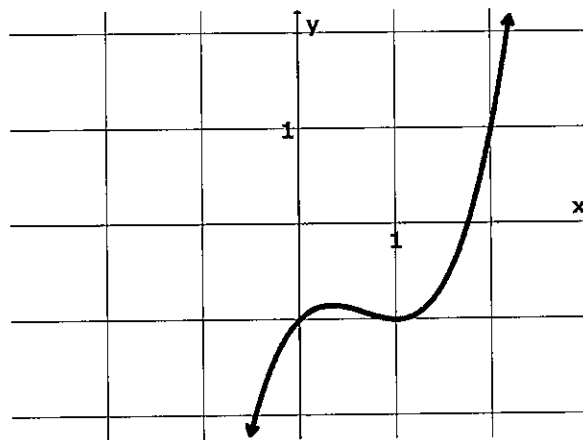
Finding Limits Using Tables and Graphs

Learning Objectives:

1. Find a Limit Using a Table (p. 872)
2. Find a Limit Using a Graph (p. 873)

Examples:

1. Use a table to find $\lim_{x \rightarrow -3} \frac{x^2 - 9}{x + 3}$.
2. Use the graph of $f(x)$ to find $\lim_{x \rightarrow 1} f(x)$ and $f(1)$.



3. Graph the function and then use your graph to find the indicated limit.

$$f(x) = x^2 - 4, \quad \lim_{x \rightarrow -3} f(x)$$

4. Use a graphing utility to find $\lim_{x \rightarrow 4} \frac{x^3 - x^2 + x - 9}{x^2 - 2x + 3}$.

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$$\textcircled{1} \lim_{x \rightarrow -3} \frac{x^2 - 9}{x + 3}$$

"The limit as
x approaches
-3"

* If the denominator will
equal zero, then factor

$$\frac{\cancel{(x+3)}(x-3)}{\cancel{(x+3)}}$$

cross out

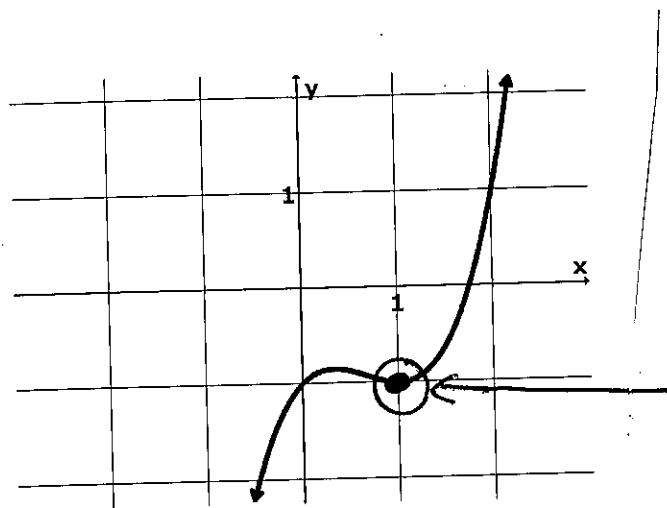
$$x - 3$$

substitute
-3 in for x

$$(-3) - 3 = \boxed{-6}$$

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$$\textcircled{2} \lim_{x \rightarrow 1} f(x) \quad \text{and} \quad \lim_{x \rightarrow 1} f(1)$$



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

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

follow the graph coming from the left (negative) side and coming from the right (positive) side. If they both go to the same number, that's your limit

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$$\textcircled{3} f(x) = x^2 - 4$$

$$\lim_{x \rightarrow -3} f(x)$$

* since we are not dividing by anything, just substitute -3 into the equation.

$$\begin{aligned} f(x) &= (-3)^2 - 4 \\ &= 9 - 4 \\ &= \boxed{5} \end{aligned}$$

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$$\textcircled{4} \quad \lim_{x \rightarrow 4} \frac{x^3 - x^2 + x - 9}{x^2 - 2x + 3}$$

* since the denominator does not equal zero, just substitute 4 in for x and solve *

$$\frac{(4)^3 - (4)^2 + (4) - 9}{(4)^2 - 2(4) + 3} = \frac{43}{11} = \boxed{3.91}$$