

Calculus I, Section 2.2, #20  
The Limit of a Function

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Guess the value of the limit (if it exists) by evaluating the function at the given numbers (correct to six decimal places).<sup>1</sup>

$$\lim_{x \rightarrow -3} \frac{x^2 - 3x}{x^2 - 9}; \quad x = -2.5, -2.9, -2.95, -2.99, -2.999, -2.9999, -3.5, -3.1, -3.05, -3.01, -3.001, -3.0001$$

We'll use the TI-84 to do the calculations. The most efficient way to do this will be to enter the function as described in "6 Important Graphing Calculator Skills." We will collect the information in a table.

$x$	$\frac{x^2-3x}{x^2-9}$
-2.5	-5
-2.9	-29
-2.95	-59
-2.99	-299
-2.999	-2999
-2.9999	-29999
-3	undefined
-3.0001	30001
-3.001	3001
-3.01	301
-3.05	61
-3.1	31
-3.5	7

From the table, it seems  $\lim_{x \rightarrow -3^-} \frac{x^2-3x}{x^2-9} = \infty$  and  $\lim_{x \rightarrow -3^+} \frac{x^2-3x}{x^2-9} = -\infty$ . Thus,

$$\lim_{x \rightarrow -3} \frac{x^2 - 3x}{x^2 - 9} \text{ does not exist.}$$

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<sup>1</sup>Stewart, *Calculus, Early Transcendentals*, p. 93, #20.