A bit more about limit notation:

\[ \lim_{x \to 4^+} f(x) = 5 \] means:

\[ \lim_{x \to 4^-} f(x) = 3 \] means:

Together:
If \( \lim_{x \to 6^+} g(x) = 2 \) and \( \lim_{x \to 6^-} g(x) = 2 \), then:

equivalent to: \( \lim_{x \to 6} g(x) = 2 \).

"two-sided limit statement"
19. **Instantaneous velocity** Consider the position function 
\( s(t) = -16t^2 + 100t \). Complete the following table with the appropriate average velocities. Then make a conjecture about the value of the instantaneous velocity at \( t = 3 \).

<table>
<thead>
<tr>
<th>Time interval</th>
<th>Average velocity</th>
</tr>
</thead>
<tbody>
<tr>
<td>[2, 3]</td>
<td>20</td>
</tr>
<tr>
<td>[2.9, 3]</td>
<td>5.6</td>
</tr>
<tr>
<td>[2.99, 3]</td>
<td>4.16</td>
</tr>
<tr>
<td>[2.999, 3]</td>
<td>4.016</td>
</tr>
<tr>
<td>[2.9999, 3]</td>
<td>4.002</td>
</tr>
</tbody>
</table>

**Inst. vel. at \( t = 3 \) is** 4

**Avg. vel. is**

\[
\text{change in position} = \frac{\Delta s}{\Delta t} = \frac{s(3) - s(2)}{3 - 2} = \frac{156 - 155.44}{1} = 0.1
\]
Easier to picture an object's motion along an axis like this:
Graphically: \( s(t) = -16t^2 + 100t \)

Average velocity on \( 2 \leq t \leq 3 \) is

\[
\frac{s(3) - s(2)}{3-2} = \frac{196 - 136}{1} = 20.
\]

The slope of the secant line is 20.

Slope here is average velocity on \([2, 3]\), so 5.6.
tangent line at $t=3$.

As $\Delta t \to 0$, slopes of secant lines approach slope of tangent line.

Notes posted at http://www.math.wsu.edu/math/faculty/remeley/welcome.html