Oscillating Functions Notes
Section 1.2b

Skim page 51 in your text. Look for and fill in the following information.

The \( \lim_{x \to c} f(x) \) does not exist when:

1. \( f(x) \) approaches a different number __________________________

2. \( f(x) \) increases or decreases _________________________________

3. \( f(x) \) oscillates between ____________________________________

We have yet to explore this third type of function.

Consider \( f(x) = \sin \left( \frac{1}{x} \right) \).

Fill in the following table. Hint: part of it is already filled in for you on page 65.

<table>
<thead>
<tr>
<th>( x )</th>
<th>(- \frac{2}{\pi})</th>
<th>(- \frac{2}{3\pi})</th>
<th>(- \frac{2}{5\pi})</th>
<th>(- \frac{2}{7\pi})</th>
<th>(- \frac{2}{9\pi})</th>
<th>(- \frac{2}{11\pi})</th>
<th>0</th>
<th>( \frac{2}{11\pi})</th>
<th>( \frac{2}{9\pi})</th>
<th>( \frac{2}{7\pi})</th>
<th>( \frac{2}{5\pi})</th>
<th>( \frac{2}{3\pi})</th>
<th>( \frac{2}{\pi})</th>
</tr>
</thead>
<tbody>
<tr>
<td>( f(x) )</td>
<td>?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. What does \( f(x) \) do as you follow the arrow from the left towards 0? Write your observation here using a complete sentence.

5. What does \( f(x) \) do as you follow the arrow from the right towards 0? Write your observation here using a complete sentence.
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6. Copy the sketch of the graph of this function from figure 1.8 on page 65 below.

7. Copy the sketch of the graph of the same function reproduced from a graphing calculator. It is figure 1.9 on page 65.

8. Read the section labeled, “TECHNOLOGY” on page 65. Why are these two graphs different?

___________________________________________________________

Which one is the correct graph? ________________________________

9. The \( \lim_{x \to 0} \sin \left( \frac{1}{x} \right) = \) ____.