limits that don't exist (DNE)

1. **Behavior that differs on left and right**

   \[
   f(x) = \begin{cases} 
   -x - 3 & x \leq 0 \\
   \frac{x^2}{x} & x > 0 
   \end{cases}
   \]

   Find \( \lim_{x \to 0^+} f(x) \) where \( f(x) = \begin{cases} 
   -x - 3 & x \leq 0 \\
   \frac{x^2}{x} & x > 0 
   \end{cases} \)

2. **Unbounded behavior**

   Find \( \lim_{x \to 0^+} \frac{1}{x} \) = \( \infty \)

   DNE

3. **Oscillating behavior**

   Find \( \lim_{x \to 0} \sin \left( \frac{1}{x} \right) \)

<table>
<thead>
<tr>
<th>( x )</th>
<th>2</th>
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<th>2</th>
<th>2</th>
<th>...</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>( f(x) )</td>
<td>_</td>
<td>_</td>
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<td>_</td>
<td>_</td>
<td>...</td>
<td>?</td>
</tr>
</tbody>
</table>

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.

\[
\begin{array}{|c|c|c|}
\hline
f(-2) & f(2) & \lim_{x \to 0} f(x) \\
\hline
\lim_{x \to -2} f(x) & \lim_{x \to 2} f(x) & \lim_{x \to 0} f(x) \\
\hline
f(0) & f(4) & \lim_{x \to 0} f(x) \\
\hline
\lim_{x \to 0} f(x) & \lim_{x \to 4} f(x) & \lim_{x \to 0} f(x) \\
\hline
\end{array}
\]