3. [4 points] Shown below are portions of the graphs of the functions \( y = f(x) \), \( y = f'(x) \), and \( y = f''(x) \). Determine which graph is which, and then, on the answer lines below, indicate after each function the letter A, B, or C that corresponds to its graph. No work or justification is needed.

![Graphs of functions](image)

**Answer:**
- \( f(x) : \ C\)
- \( f'(x) : \ B\)
- \( f''(x) : \ A\)

4. [8 points] Suppose \( f(x) \) and \( g(x) \) are functions that have exactly the same four critical points, namely at \( x = 1, x = 3, x = 5, \) and \( x = 7 \). Note that \( f \) and \( g \) have no other critical points beyond these four. Assume the first and second derivatives of \( f(x) \) and \( g(x) \) exist everywhere.

The table below shows some values of \( f'(x) \) and \( g''(x) \) at certain inputs. Note that the table gives values of the first derivative of \( f(x) \) and the second derivative of \( g(x) \).

<table>
<thead>
<tr>
<th>( x )</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>( f'(x) )</td>
<td>3</td>
<td>0</td>
<td>-1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>?</td>
</tr>
<tr>
<td>( g''(x) )</td>
<td>?</td>
<td>0</td>
<td>-1</td>
<td>-4</td>
<td>?</td>
<td>0</td>
<td>?</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

**a.** [4 points] Use the table to classify each critical point of \( f \) as a local minimum, maximum, or neither of \( f \). Circle your answer. If there is not enough information to decide, circle NEI.

i. \( x = 1 \) is a **LOCAL MIN of \( f \)**
ii. \( x = 3 \) is a **LOCAL MIN of \( f \)**
iii. \( x = 5 \) is a **LOCAL MIN of \( f \)**
iv. \( x = 7 \) is a **LOCAL MIN of \( f \)**

**b.** [4 points] Use the table to classify each critical point of \( g \) as a local minimum, maximum, or neither of \( g \). Circle your answer. If there is not enough information to decide, circle NEI.

i. \( x = 1 \) is a **LOCAL MIN of \( g \)**
ii. \( x = 3 \) is a **LOCAL MIN of \( g \)**
iii. \( x = 5 \) is a **LOCAL MIN of \( g \)**
iv. \( x = 7 \) is a **LOCAL MIN of \( g \)**

**Solution:** Part a. follows from the First Derivative Test, and most of b. from the Second Derivative Test. For b.(iii.), note that \( g \) must be decreasing on both \((3, 5)\) and \((5, 7)\) since \( x = 5 \) is the only critical point of \( g \) on \((3, 7)\) and we have \( g''(3) < 0 \) but \( g''(7) > 0 \).