1. [14 points] Let $g$ be a twice differentiable function defined on $-1 < x < 11$. Some values of $g(x)$, \( g'(x) \) and \( g''(x) \) are shown in the table below.

<table>
<thead>
<tr>
<th>$x$</th>
<th>0</th>
<th>2</th>
<th>4</th>
<th>6</th>
<th>8</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>$g(x)$</td>
<td>-2</td>
<td>-1</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>$g'(x)$</td>
<td>0.5</td>
<td>2</td>
<td>?</td>
<td>5</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>$g''(x)$</td>
<td>2</td>
<td>1</td>
<td>5</td>
<td>-3</td>
<td>-1</td>
<td>0.5</td>
</tr>
</tbody>
</table>

a. [7 points] Find the exact value of the following expressions. If there is not enough information to compute the value, write “NI”. Show all your work.

i) Let \( h(x) = 2^g(x) \). Find \( h'(6) \).

\[ h'(6) = \]

ii) Let \( k(x) = g(x)g'(x) \). Find the value of \( g'(4) \) if \( k'(4) = 15 \).

\[ g'(4) = \]

iii) Let \( r(x) = \frac{\sin(x)}{g(x)} \). Find \( r'(0) \).

\[ r'(0) = \]

b. [7 points] Let \( j(x) = g(14 - 4x) \).

i) Use the values from the table to find a formula for \( L(x) \), the linear approximation to \( j(x) \) at \( x = 2 \).

\[ L(x) = \]

ii) Find an approximate value for \( j(2.25) \) using your formula for \( L(x) \).

\[ j(2.25) \approx \]

iii) Is your value an overestimate or underestimate of the exact value of \( j(2.25) \)? Circle your answer.

OVERESTIMATE  UNDERESTIMATE  NOT ENOUGH INFORMATION