6. [13 points] Values of a function \( g(x) \) and some of its derivatives at \( x = 2 \) are given in the table below. Use this information for some of the problems below.

<table>
<thead>
<tr>
<th>( g(2) )</th>
<th>( g'(2) )</th>
<th>( g''(2) )</th>
<th>( g'''(2) )</th>
<th>( g^{(4)}(2) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>-4</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

a. [4 points] Find the first 4 nonzero terms of the Taylor series of \( g(x) \) about \( x = 2 \). Write your final answer as a polynomial \( P(x) \) in the blank below.

\[
P(x) = \]

b. [4 points] Using known Taylor series, find the first 3 nonzero terms of the Taylor series of \( f(x) = (x - 2) \ln \left( \frac{x}{2} \right) \) about \( x = 2 \). Write your final answer as a polynomial \( Q(x) \) in the blank below. (Hint: \( f(x) = (x - 2) \ln \left( 1 + \frac{(x - 2)}{2} \right) \))

\[
Q(x) = \]

c. [5 points] Let \( H(x) = 1 + \int_2^x f(t) + g(t) \, dt \). Find the first 4 nonzero terms of the Taylor series of \( H \) about \( x = 2 \). Write your final answer as a polynomial \( R(x) \) in the blank below. Partial credit may be given for finding the appropriate terms of \( \int_2^x f(t) \, dt \) or \( \int_2^x g(t) \, dt \).

\[
R(x) = \]