1. Consider the function \( f(x) = x^3 - 3x^2 - 6 \).

   a) Find the intervals over which \( f(x) \) is increasing. Justify your answer using a sentence that connects the behavior of \( f(x) \) to the sign of \( f'(x) \).

   b) Identify all extrema (relative maximums and relative minimums) of \( f(x) \). Justify your answer using sentences involving \( f'(x) \).

2. Find the x-coordinate of the inflection point on the graph of \( g(x) = \cos x \) on the interval \((0, \pi)\). Justify your response.
3. Find the maximum value of \( f(x) = \frac{2x^2}{x-4} \) on the closed interval \([-2, 2]\).

4. The table below shows certain values for the continuous and differentiable function, \( f(x) \). Use the table to answer the next two questions concerning the derivative of \( f(x) \).

<table>
<thead>
<tr>
<th>( x )</th>
<th>1</th>
<th>6</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>( f(x) )</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>5</td>
</tr>
</tbody>
</table>

a) Identify an interval over which \( f'(x) \) is guaranteed to be zero for at least one point on the interval. Justify your response. (3 pts)

b) Is there guaranteed to be a point on the interval \([6,10]\) where \( f'(x) = 1 \)? Justify your response.