5.1 Lecture Notes Example 5
The diagram shows the graph of the function $g$ on the domain $[0, 16]$. Use it to answer the questions below. (Missing questions to be provided in class.)

What to do:
- Copy the features listed on the next slide into the first column of the table.
- List the coordinates at which each feature occurs in the second column.
- Fill in the blanks in the bullets under “Key observations.”
- Check your answers with a peer or your instructor.
Answer in coordinates.

<table>
<thead>
<tr>
<th>Endpoints</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical points</td>
<td></td>
</tr>
<tr>
<td>Singular points</td>
<td></td>
</tr>
<tr>
<td>Stationary points</td>
<td></td>
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<tr>
<td>Relative maxima</td>
<td></td>
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<tr>
<td>Relative minima</td>
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</tr>
<tr>
<td>Absolute maxima</td>
<td></td>
</tr>
<tr>
<td>Absolute minima</td>
<td></td>
</tr>
</tbody>
</table>

Give one example of an input $x$ at which the following hold:

<table>
<thead>
<tr>
<th>$g'(x) &gt; 0$</th>
<th>$x =$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$g'(x) &lt; 0$</td>
<td>$x =$</td>
</tr>
<tr>
<td>$g'(x) = 0$</td>
<td>$x =$</td>
</tr>
</tbody>
</table>
There will be a quiz over a First Derivative Test problem in Week 12 Activity, after Spring Break.

Worksheet
She found the derivative \( h'(x) = 12x^3 - 48x^2 - 36x + 216 \), and she was able to factor it into

\[
h'(x) = 12(x - 3)^2(x + 2).
\]

Example 6
Use the first derivative test to find the relative maxima and minima of the function \( f(x) = 3x^4 + 5x^3 \) on the domain \((-\infty, \infty)\). Determine the intervals of increase and decrease on this domain. Complete the answer box, if there are no answers, write “none.”

Example 7
Use the first derivative test to find the relative maxima and minima of the function \( f(x) = 3x^4 + 4x^3 - 36x^2 + 10 \) on the domain \([1, \infty)\). Determine the intervals of increase and decrease on this domain. Complete the answer box, if there are no answers, write “none.”
More than any problems we’ve done so far, these have solutions not just answers.

What to do:

• Find the critical points (singular and stationary)
• Draw a number line, and plot the critical points.
Get your work checked.

• Choose a test point in each interval. Determine if the function increases or decreases on each interval, and draw arrows.
  
  *Show your work:* When you write your solution, make it clear what test point you used and that you evaluated the derivative.
Get your work checked.

• Fill out the answer box.
Get your work checked.
Example 6

Critical points
(0, 0) and (–1.25, –2.44)

Intervals of increase
(–1.25, ∞)

Intervals of decrease
(–∞, –1.25)

Relative maxima
none

Relative minima
(–1.25, –2.44)

Example 7

Critical points
(2, –54)

Intervals of increase
(2, ∞)

Intervals of decrease
[1, 2)

Relative maxima
(1, –19)

Relative minima
(2, –54)