On the test and final exam you will be given a question such as:

Provide a complete sketch of the following function using the steps discussed in class. Note that the first and second derivatives are given.

\[ f(x) = \ldots \quad f'(x) = \ldots \quad f''(x) = \ldots \]

The following is a summary of what I’ll be looking for.

**Step 1 (1-3 Marks): General observations**

- Domain: Look for even radicals (i.e. \( \sqrt{x} \)) and where the denominator is equal to 0.
- Find some of the “easy” \( x \) and \( y \) intercepts

**Step 2 (3-6 Marks): Horizontal and Vertical Asymptotes (HA & VA)**

- HA: “How does \( f(x) \) behave when \( x \) is large?”
  Provided that the domain includes the infinity limit(s), evaluate the following:
  \[ \lim_{x \to -\infty} f(x) = \quad \lim_{x \to \infty} f(x) = \]
- VA: “How does \( f(x) \) behave when it blows up?”
  If the denominator of \( f(x) \) is undefined at \( x = a \), evaluate the following:
  \[ \lim_{x \to a^-} f(x) = +\infty \text{ or } -\infty \quad \lim_{x \to a^+} f(x) = +\infty \text{ or } -\infty \]

**Step 3 (3-6 Marks): Critical Points & Max/Min**

- Part A: Find all values of \( x \) where \( f'(x) = 0 \) and \( f'(x) \) is undefined.
- Part B: Determine the sign of \( f'(x) \) near the points in Part A to find if \( f(x) \) is increasing \( (f'(x) > 0) \) or decreasing \( (f'(x) < 0) \). A table like the one below is suggested to help you summarize these observations:

<table>
<thead>
<tr>
<th>( x )</th>
<th>( x &lt; a )</th>
<th>( x = a )</th>
<th>( a &lt; x )</th>
</tr>
</thead>
<tbody>
<tr>
<td>sign of ( f'(x) )</td>
<td>+ or -</td>
<td>0 or DNE</td>
<td>+ or -</td>
</tr>
<tr>
<td>( f(x) )</td>
<td>↑ or ↓</td>
<td>( f(a) )</td>
<td>↑ or ↓</td>
</tr>
</tbody>
</table>

**Step 4 (3-6 Marks): Points of Inflection & Curvature**

Repeat Step 3 but with \( f''(x) \) rather than \( f'(x) \).

**Step 5 (3-5 Marks): Sketch the function**