1. **Multiple Choice** Which graph represents \( y = \sqrt{-0.5x - 2} \)?

![Graphs A, B, C, and D]

2. **Multiple Choice** Which statement about the graph of \( y = \frac{x^2 - 5x + 6}{x - 3} \) is true?

A. There is a vertical asymptote with equation \( y = 3 \).
B. There is an oblique asymptote with equation \( y = x - 2 \).
C. There is a horizontal asymptote with equation \( x = 2 \).
D. There is a hole at \((3, 1)\).

3. Without using graphing technology, graph the function \( y = \frac{x^2 + 3x + 2}{x^2 - x - 2} \). Identify any non-permissible values of \( x \), the equations of any asymptotes, and the domain.

Factor: \( y = \frac{(x + 1)(x + 2)}{(x + 1)(x - 2)} \)

There is a common factor \((x + 1)\), so there is a hole at: \( x = -1 \)
There is a vertical asymptote with equation \( x = 2 \).
The function is: \( y = \frac{x + 2}{x - 2}, x \neq -1 \)
The \( y \)-coordinate of the hole is: \( y = -1 \frac{1}{3} \)
There is a horizontal asymptote. Both the leading coefficients are 1, so the horizontal asymptote has equation \( y = 1 \).

Choose other points and those close to the asymptotes:

<table>
<thead>
<tr>
<th>( x )</th>
<th>4</th>
<th>6</th>
<th>1.99</th>
<th>2.01</th>
<th>-100</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y )</td>
<td>3</td>
<td>2</td>
<td>-399</td>
<td>401</td>
<td>0.96</td>
<td>1.04</td>
</tr>
</tbody>
</table>

Some of the \( y \)-values above are approximate.
The \( y \)-intercept is \(-1\). The \( x \)-intercept is \(-2\).
Plot points at the intercepts. Draw an open circle at the hole. Draw broken lines for the asymptotes, then sketch 2 smooth curves.
The domain is: \( x \neq -1, x \neq 2 \).
4. a) The graph of \( y = f(x) \) is given. On the same grid, sketch the graph of \( y = \sqrt{f(x)} \).

Mark points where \( y = 0 \) or \( y = 1 \).
\( y = \sqrt{f(x)} \) is not defined for \( x < -2 \) or \( x > 6 \).
Choose, then mark another point for \( -2 \leq x \leq 6 \).

<table>
<thead>
<tr>
<th>( x )</th>
<th>( y = f(x) )</th>
<th>( y = \sqrt{f(x)} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

Join the points with a smooth curve.

b) Identify the domain and range of each function in part a, then explain why the domains are different and the ranges are different.

For \( y = f(x) \), domain is: \( x \in \mathbb{R} \); range is: \( y \leq 4 \)
For \( y = \sqrt{f(x)} \), domain is: \( -2 \leq x \leq 6 \); range is: \( 0 \leq y \leq 2 \)
The domains are different because \( y = f(x) \) is defined for all real values of \( x \) while \( y = \sqrt{f(x)} \) is only defined for values of \( x \) for which \( f(x) \geq 0 \).
The ranges are different because \( f(x) \) can have any value less than or equal to 4, while \( \sqrt{f(x)} \) can only be 0 or positive.

5. Use graphing technology to solve each equation. Give the solution to the nearest tenth.

a) \( x - 5 = \sqrt{2x + 1} \)

Graph a related function:
\( f(x) = x - 5 - \sqrt{2x + 1} \)
Use graphing technology to determine the zero: \( x = 9.5 \)

b) \( \frac{x - 2}{2x + 1} + 2 = \frac{x + 1}{x + 3} \)

Graph a related function:
\( f(x) = \frac{x - 2}{2x + 1} + 2 - \frac{x + 1}{x + 3} \)
Use graphing technology to determine the zeros:
\( x = -4.1 \) or \( x = 0.1 \)
6. Without using graphing technology, match each function to its graph. Justify your choice.

i) $y = \frac{x + 1}{x^2 - 4}$

The function is undefined when $x^2 - 4 = 0$; that is, when $x = \pm 2$. There are no common factors so the graph has vertical asymptotes at $x = \pm 2$.

The function matches Graph A.

Factor: $y = \frac{(x - 4)(x + 1)}{x + 1}$

There are no common factors, so there is a vertical asymptote at $x = 1$. Since the degree of the numerator is 1 more than the degree of the denominator, there is an oblique asymptote.

The function matches Graph D.

ii) $y = \frac{x^2 - 3x - 4}{x - 1}$

Factor: $y = \frac{(x - 4)(x + 1)}{x - 1}$

There are no common factors, so there is a vertical asymptote at $x = 1$. Since the degree of the numerator is 1 more than the degree of the denominator, there is an oblique asymptote.

The function matches Graph D.

iii) $y = \frac{x^2 - 3x - 4}{x + 1}$

Factor: $y = \frac{(x - 4)(x + 1)}{x + 1}$

There are no common factors, so there is a vertical asymptote at $x = -1$. The function matches Graph C.

iv) $y = \frac{x^3 - 4}{x + 1}$

The function is undefined when $x = -1$. There are no common factors, so there is a vertical asymptote at $x = -1$.

The function matches Graph C.