1. (10 pts.) This problem concerns the functions \( f(x) = \frac{\sqrt{x-1}}{5+\sin(x)} \) and \( g(x) = \sqrt{x} - 1 \).

   (a) State the domain of \( f(x) \).

   (b) \( f \circ g(x) = \)

2. (10 pts.) Consider the equation \( 4 \cos^2(x) - 3 = 0 \). Find all solutions \( x \) that lie in the interval \([0, 2\pi)\).

3. (10 pts.) Sketch the graph of any function \( y = f(x) \) that meets the following four criteria: The line \( x = 4 \) is a vertical asymptote, the line \( y = -1 \) is a horizontal asymptote, \( f(-4) = 2 \), and \( \lim_{x \to -3} f(x) = 0 \).
4. (20 pts.) Answer the following questions about the function \( y = f(x) \) graphed below.

(a) \( f(1) = \)

(b) \( f \circ f(2) = \)

(c) \( \lim_{x \to 0} f(x) = \)

(d) \( \lim_{x \to -1} f(x) = \)

(e) \( \lim_{x \to -1^+} f(x) = \)

(f) \( \lim_{x \to -1^-} f(x) = \)

(g) \( \lim_{x \to \infty} f(x) = \)

(h) \( \lim_{x \to -\infty} f(x) = \)

(i) State an interval on which \( f(x) \) is continuous.

(j) State an \( x \)-value at which \( f(x) \) is discontinuous.

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5. (28 pts.) Evaluate the following limits.
   If you want credit, show your steps, explain your reasoning, and carry limits as appropriate.

(a) \( \lim_{x \to -1} \frac{x^2 - 3x - 4}{x^2 + 5x + 4} = \)

(b) \( \lim_{h \to 0} \frac{\sqrt{5-h} - \sqrt{5}}{h} = \)

(c) \( \lim_{x \to -3} \frac{(-x + 3)(x + 5)}{|-x + 3|} = \)

(d) \( \lim_{\theta \to 0} \frac{\frac{1}{5} \sin(5\theta)}{\cos(\theta)} = \)
6. (12 pts.) Find all the horizontal asymptotes and vertical asymptotes of \( f(x) = \frac{x^2 + 5x + 4}{x^2 + 6x + 8} \).

7. (10 pts.) Find the value \( a \) such that the following \( f(x) \) is continuous at every number \( x \).

\[
f(x) = \begin{cases} 
-x^2 + 2 & \text{if } x < 3 \\
ax & \text{if } x \geq 3
\end{cases}
\]