1. Find all vertical asymptotes of the given function.

\[ f(x) = \frac{-x^2 + 16}{x^2 + 5x + 4} \]

- A. \( x = -1 \)
- B. \( x = -1, x = 4 \)
- C. \( x = 1, x = -4 \)
- D. \( x = -1, x = -4 \)

2. Find \( \lim_{x \to 2} \frac{x + 5}{x^2 + 8x + 15} \).

\[ \lim_{x \to 2} \frac{x + 5}{x^2 + 8x + 15} = \]

3. Find the limit.

\[ \lim_{x \to 4} \frac{24x - 6x^2}{2 - \sqrt{x}} \]

\[ \lim_{x \to 4} \frac{24x - 6x^2}{2 - \sqrt{x}} = \]

(Type an integer or a simplified fraction.)

4. Write the trigonometric expression as an algebraic expression in \( u \).

\[ \sin \left( \csc^{-1} u \right) \]

\[ \sin \left( \csc^{-1} u \right) = \] (Type an exact answer, using radicals as needed.)

5. Determine if the following function has a slant asymptote, and if so compute the slant asymptote.

\[ f(x) = \frac{x^3 - 1}{x^2 - 5x + 5} \]

- A. The slant asymptote is \( y = mx + b \) with \( m = \) _______ and \( b = \) _______
- B. There is no slant asymptote
6. Graph the function.

\[ y = \log_5(x - 2) \]

- **A.**
- **B.**
- **C.**
- **D.**

7. Analyze the following limit.

\[ \lim_{x \to 0^-} \frac{x^4 \cos(\pi x)}{\ln(x)} \]

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** \( \lim_{x \to 0^-} \frac{x^4 \cos(\pi x)}{\ln(x)} = \) __________
- **B.** The limit does not exist and is neither \( \infty \) nor \(-\infty\).

8. Determine the value of the constant \( a \) for which the function \( f(x) \) is continuous at \(-4\).

\[
  f(x) = \begin{cases} 
    x^2 + 6x + 8 & \text{if } x \neq -4 \\
    \frac{x + 4}{a} & \text{if } x = -4 
  \end{cases}
\]

The function \( f(x) \) is continuous at \(-4\) when \( a = \) __________. (Type an integer or a fraction.)
**9.** For the function \( g(x) \) graphed here, find the following limits or state that they do not exist.

<table>
<thead>
<tr>
<th>a. ( \lim_{{x \to -4}} g(x) )</th>
<th>b. ( \lim_{{x \to -2}} g(x) )</th>
<th>c. ( \lim_{{x \to 0}} g(x) )</th>
<th>d. ( \lim_{{x \to -0.8}} g(x) )</th>
</tr>
</thead>
</table>

Midterm Exam 1

a. What is \( \lim_{{x \to -4}} g(x) \)? Choose the correct answer below and, if necessary, fill in the answer box to complete your choice.

- A. \( \lim_{{x \to -4}} g(x) = \underline{\text{?}} \)
- B. \( \lim_{{x \to -4}} g(x) \) does not exist

b. What is \( \lim_{{x \to -2}} g(x) \)? Choose the correct answer below and, if necessary, fill in the answer box to complete your choice.

- A. \( \lim_{{x \to -2}} g(x) = \underline{\text{?}} \)
- B. \( \lim_{{x \to -2}} g(x) \) does not exist

c. What is \( \lim_{{x \to 0}} g(x) \)? Choose the correct answer below and, if necessary, fill in the answer box to complete your choice.

- A. \( \lim_{{x \to 0}} g(x) = \underline{\text{?}} \)
- B. \( \lim_{{x \to 0}} g(x) \) does not exist

d. What is \( \lim_{{x \to -0.8}} g(x) \)? Choose the correct answer below and, if necessary, fill in the answer box to complete your choice.

- A. \( \lim_{{x \to -0.8}} g(x) = \underline{\text{?}} \)
- B. \( \lim_{{x \to -0.8}} g(x) \) does not exist

**10.** Solve for all angles \( \theta \) where \( 0 \leq \theta \leq 2\pi \).

\[
\sin 2\theta + 2 \cos^2 \theta = 0
\]

\( \theta = \underline{\text{?}} \)

(Use a comma to separate answers as needed. Type an exact answer in terms of \( \pi \).)
11. Consider the function \( f(x) = \frac{9e^x + 4e^{-x}}{e^x - 4e^{-x}} \). Use various limits to find the asymptotes.

a) Compute \( \lim_{x \to \infty} f(x) = \) ____________

b) Compute \( \lim_{x \to -\infty} f(x) = \) ____________

c) Determine the vertical asymptote(s). Select the correct choice below and, if necessary, fill in the answer box(es) to complete your choice.

- **A.** The function has one vertical asymptote, \( x = \) ____________.
- **B.** The function has two vertical asymptotes. The leftmost asymptote is \( x = \) ____________, and the rightmost asymptote is \( x = \) ____________.
- **C.** The function has no vertical asymptotes.