1.) Determine the following limits.

a.) \( \lim_{x \to 1} \frac{x^3 - 1}{x^2 - 1} \)

b.) \( \lim_{x \to 0} \frac{\sqrt{3 + x} - \sqrt{3 - x}}{x} \)

c.) \( \lim_{x \to 2} \frac{\frac{1}{x - 1} - \frac{1}{5 - 2x}}{x - 2} \)

d.) \( \lim_{x \to \infty} \frac{2x^2 + 5}{7x^3 - 4} \)
2.) a.) Determine the domain of \( f(x) = \sqrt{7 - x} \).

b.) Determine the range of \( f(x) = 3 + 5\sin x \).

5. (pts total) Let \( X = \log x \) and \( Y = \log y \) for the following problems

(a) (pts) When the following table data is graphed on a log-log plot (i.e. using \( X \) and \( Y \) coordinates), a straight line results. Determine the equation of this line and graph the resulting line on a log-log plot.

<table>
<thead>
<tr>
<th>( x )</th>
<th>( X )</th>
<th>( y )</th>
<th>( Y )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>10000</td>
<td>4</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>100</td>
<td>2</td>
</tr>
</tbody>
</table>

(b) (pts) Assume in part (a) your equation of a line was \( Y = -4X + 1 \), use the appropriate logarithmic transformation to find the function relationship between \( x \) and \( y \).
4.) Consider the following function \( f(x) = \begin{cases} \frac{x^2 - 3x}{x^2 - 9}, & \text{if } x \neq 3, -3 \\ \frac{1}{2}, & \text{if } x = 3 \\ 0, & \text{if } x = -3 \end{cases} \).

Determine if \( f \) is continuous at \( x = 3 \).

5.) Determine all possible fixed points for the following recursion: \( a_{n+1} = \frac{3a_n^2}{a_n^2 - 4} \).
6.) Consider the function \( f(x) = \frac{x}{3-x} \).
   
a.) Show algebraically that \( f \) is one-to-one.

   b.) Determine \( y = f^{-1}(x) \), the inverse function for \( y = f(x) \).

7.) Find a formula for the nth term (starting with n=0) of each of the following sequences.
   
a.) \( \frac{7}{2}, \frac{4}{4}, \frac{1}{8}, \frac{-2}{16}, \frac{-5}{32}, \frac{-8}{64}, \cdots \)
b.) 5, 7, 10, 14, 19, 25, 32, 

(HINT: Use the fact that $1 + 2 + 3 + 4 + \cdots + n = \frac{n(n + 1)}{2}$.)

8.) Use the Squeeze Principle (Sandwich Theorem) to determine the limit of the following sequence:

$$a_n = \frac{n + 3 \sin n}{n + 3}$$
(b) Consider the following function

\[
f(x) = \begin{cases} 
1 & \text{if } x \leq -1 \\
Ax^2 + Bx & \text{if } -1 < x < 2 \\
10 & \text{if } x \geq 2
\end{cases}
\]

Use limits and a "fake graph" to determine the value of constants \(A\) and \(B\) so that the following function is continuous for all values of \(x\).

The following EXTRA CREDIT PROBLEM is worth . This problem is OPTIONAL.

1.) Determine the next three numbers in the following sequence:

\(-2, 0, 0, 4, 18, 48, 100, \cdots \)