1.) Determine the following limits.

a.) $\lim_{x \to 1} \dfrac{x^3 - 1}{x^2 - 1}$

b.) $\lim_{x \to 0} \dfrac{\sqrt{3+x} - \sqrt{3-x}}{x}$

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

d.) $\lim_{x \to \infty} \dfrac{2x^2 + 5}{7x^3 - 4}$

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.

x	X	y	Y
1	0	10000	4
10	1	100	2

(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 $f(x) = \begin{cases} \dfrac{x^2-3x}{x^2-9}, & \text{if } x \neq 3, -3 \\ \frac{1}{2}\ , & \text{if } x = 3 \\ 0\ , & \text{if } x = -3\ . \end{cases}$

Determine if f is continuous at $x = 3$.

5.) Determine all possible fixed points for the following recursion : $a_{n+1} = \dfrac{3a_n^2}{a_n^2 - 4}$

6.) Consider the function $f(x) = \dfrac{x}{3-x}$.

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.) $\dfrac{7}{2}, \dfrac{4}{4}, \dfrac{1}{8}, \dfrac{-2}{16}, \dfrac{-5}{32}, \dfrac{-8}{64}, \cdots$

b.) $5, 7, 10, 14, 19, 25, 32, \cdots$

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

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 :
$-2, 0, 0, 4, 18, 48, 100, \cdots$