1.) Two enterprising college women decide to start their own nationwide service sorority called Alpha Beta Zeta. Assume that each year the number of women in Alpha Beta Zeta triples. Let \( t \) be the number of years and let \( N_t \) be the number of women in Alpha Beta Zeta at time \( t \).
   a.) State the initial value and a recursion for \( N_t \).
   b.) Determine an exponential growth formula for \( N_t \) for \( t = 0, 1, 2, 3, 4, \ldots \).
   c.) How many women are in Alpha Beta Zeta after 5 years? after 10 years?
   d.) How long does it take for the number of members to reach 3,188,646?

2.) There are 2,000,000,000 people worldwide watching the Super Bowl on TV. Every 10 minutes, 2% of the viewers turn the game off. Let \( t \) be the number of 10 minute intervals and let \( N_t \) be the number of viewers at time \( t \).
   a.) State the initial value and a recursion for \( N_t \).
   b.) Determine an exponential decay formula for \( N_t \) for \( t = 0, 1, 2, 3, 4, \ldots \).
   c.) How many people are watching the Super Bowl after 40 minutes? after 3 hours?
   d.) How long does it take for the number of viewers to reach 1,634,145,614?

3.) Compute the first five terms (starting with \( n=0 \)) of each sequence. Determine whether each sequence converges or diverges.
   a.) \( a_n = 3 \)  b.) \( a_n = 3^n \)  c.) \( a_n = \frac{3}{n} \)  d.) \( a_n = \left(\frac{1}{3}\right)^n \)  e.) \( a_n = 3^{1/n} \)
   f.) \( a_n = \frac{n+5}{n+2} \)  g.) \( a_n = n(3-n) \)  h.) \( a_n = \frac{n^3+n^2-n+7}{4n^3+5n^2-2} \)  i.) \( a_n = (0.9999)^n \)
   j.) \( a_n = (1.00001)^n \)  k.) \( a_n = \left(\frac{-2}{3}\right)^n \)  l.) \( 14/3, 15/5, 16/7, 17/9, \ldots \)
   m.) \( a_n = \sin n\pi \)  n.) \( a_n = \left(\frac{\sqrt{7}}{\ln 14}\right)^n \)  o.) \( a_n = \cos(2n\pi) \)  p.) \( a_n = (1 + 1/n)^3 \)
   q.) \( a_n = n(n-1)(n-2)(n-3)(n-4) \)  r.) \( a_n = \sin(\pi/2 + n\pi) \)
   s.) \( a_n = 3 + (-1)^n \)

4.) Find a formula \( a_n \), where \( n = 0, 1, 2, 3, 4, \ldots \), for each of the following sequences.
   a.) \( 1, 3, 5, 7, 9, \ldots \)  b.) \( 2, 4, 6, 8, 10, \ldots \)  c.) \( 1, 4, 9, 16, 25, \ldots \)
   d.) \( 3, 7, 11, 15, 19, \ldots \)  e.) \( 12, 36, 108, 324, 972, \ldots \)  f.) \( 1, -1, 1, -1, 1, \ldots \)
   g.) \( 4, 8, 4, 8, 4, \ldots \)  h.) \( 0, 0, 2, 6, 12, 20, 30, \ldots \)
   i.) \( 4/3, 7/7, 10/11, 13/15, 16/19, 19, 23 \ldots \)  j.) \( -1/9, 1/3, -1, 3, -9, 27, -81, \ldots \)
   (FACT: \( 1 + 2 + 3 + \ldots + n = (1/2)n(n+1) \))
   k.) \( 1, 3, 6, 10, 15, 21, 28, \ldots \)  l.) \( 4, 8, 13, 19, 26, 34, 43, \ldots \)

5.) Determine how many numbers are in each finite list.
   a.) \( 2, 4, 6, 8, 10, \ldots, 9864 \)  b.) \( 55, 57, 59, 61, 63, \ldots, 637 \)
   c.) \( 3^7, 3^{11}, 3^{15}, 3^{19}, \ldots, 3^{203} \)  d.) \( 3, 6, 10, 15, 21, \ldots, 1891 \)
e.) 1, 2, 4, 7, 8, 10, 13, 14, 16, 19, 20, 22, ..., 601, 602, 604

6.) Find the 15th number in the following sequence: 1, 1, 2, 3, 5, 8, 13, 21, 34, ...

7.) Find the 200th number in the following sequence: 3, 7, 11, 15, 19, 23, ...

8.) A super ball bearing is dropped from a building 1000 feet high. Each time the ball bearing rebounds to 75% of its falling distance. How high does the ball bounce on its 20th rebound?

10.) Determine the limit of the following sequence:

\[ 2, \ 2 - \frac{1}{2}, \ 2 - \frac{1}{2 - \frac{1}{2}}, \ 2 - \frac{1}{2 - \frac{1}{2 - \frac{1}{2}}}, \ 2 - \frac{1}{2 - \frac{1}{2 - \frac{1}{2 - \frac{1}{2}}}} \ ... \]

11.) Use algebra to evaluate the following limits.

a.) \( \lim_{x \to 2} \frac{x^2 + 3x}{x^2 - 16} \)

b.) \( \lim_{x \to 1} \frac{x^2 + x - 2}{x - 4} \)

c.) \( \lim_{x \to 4} \frac{\sqrt{x} - 2}{x - 4} \)

d.) \( \lim_{x \to -1} \frac{1}{x + 1} \)

e.) \( \lim_{x \to 2} \cos \frac{x}{3} \)

f.) \( \lim_{x \to -1} \frac{1}{4} \)

g.) \( \lim_{x \to 0} \frac{\sqrt{x^2 + 16} - 4}{x^2} \)

The following problem is for recreational purposes only.

12.) Plant 10 trees in 5 straight rows of four trees each.