DUE Friday, October 3 at the beginning of class

1. Let \( a_n = \frac{1}{2n} \)
   
   (a) Find the first 10 terms of the sequence and graph the points \((n, a_n)\) on a Cartesian plane.
   
   (b) Find the limit of the sequence, if it exists. Justify your answer, referencing the graph you made in part 1a.
   
   (c) For which values of \( n \) will \( a_n \) be within \( \frac{1}{25} \) of the limit?

2. List all of the following words that correctly describe the sequence: alternating, bounded above, bounded below, strictly increasing, strictly decreasing, convergent, divergent. If the sequence converges, find the limit.
   
   (a) \( g(n) = (-1)^{2n}7 \)
   
   (b) \( b_n = (3n - 1)^{-1} \)
   
   (c) \( c_n = \frac{n^3}{n + 1} \)
   
   (d) \( f(n) = \frac{2n - 1}{5 - 3n} \)

3. Use the limit laws and the fact that \( \lim_{n \to \infty} \frac{1}{n} = 0 \) to determine the limit of the sequence generated by each function.
   
   (a) \( e_n = \frac{2n}{n + 1} \)
   
   (b) \( a_n = \frac{n^3}{n^3 + 1} \)
   
   (c) \( b_n = \frac{13n + 5n^2 + 1}{6 - 2n^2} \)
   
   (d) \( f(n) = \frac{n^2 + 9}{3n^3 - n^2 + 7n + 1} \)
   
   (e) \( g(n) = \sqrt{\frac{n + 1}{9n + 1}} \)
   
   (f) \( p(n) = \frac{3 + 5n^2}{n + n^2} \)
   
   (g) \( d_n = \frac{\sqrt{2n^2 + 1}}{3n - 5} \)
   
   (h) \( h(n) = \frac{n^2 + n}{3 - n} \)
4. Determine whether the sequence defined as follows is convergent or divergent:

\[ a_1 = 1 \quad a_{n+1} = 4 - a_n \quad \text{for} \quad n \geq 1 \]

5. Find a formula for the general term \( a_n \) of the sequence, assuming that the pattern of the first few terms continues. Determine whether the sequence converges or diverges.

(a) \( \{1, -\frac{1}{3}, \frac{1}{9}, -\frac{1}{27}, \frac{1}{81}, \ldots \} \)

(b) \( \{5, 8, 11, 14, 17, \ldots \} \)

(c) \( \left\{ \frac{1}{2}, -\frac{4}{3}, \frac{9}{4}, -\frac{16}{5}, \frac{25}{6}, \ldots \right\} \)

(d) \( \left\{ \frac{5}{4}, -\frac{5}{2}, 5, -10, \ldots \right\} \)