Math 115 **Homework 4** **Fall 2014**

DUE Friday, October 3 at the beginning of class

1. Let $a_n = \dfrac{1}{2n}$

   (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 $\dfrac{1}{25}$ 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) $c_n = \dfrac{n^3}{n+1}$

   (d) $f(n) = \dfrac{2n-1}{5-3n}$

3. Use the limit laws and the fact that $\lim_{n\to\infty} \dfrac{1}{n} = 0$ to determine the limit of the sequence generated by each function.

   (a) $e_n = \dfrac{2n}{n+1}$

   (b) $a_n = \dfrac{n^3}{n^3+1}$

   (c) $b_n = \dfrac{13n+5n^2+1}{6-2n^2}$

   (d) $f(n) = \dfrac{n^2+9}{3n^3-n^2+7n+1}$

   (e) $g(n) = \sqrt{\dfrac{n+1}{9n+1}}$

   (f) $p(n) = \dfrac{3+5n^2}{n+n^2}$

   (g) $d_n = \dfrac{\sqrt{2n^2+1}}{3n-5}$

   (h) $h(n) = \dfrac{n^2+n}{3-n}$

4. Determine whether the sequence defined as follows is convergent or divergent:

$$a_1 = 1 \qquad a_{n+1} = 4 - a_n \qquad \text{for } n \geq 1$$

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) $\{1, -\frac{1}{3}, \frac{1}{9}, -\frac{1}{27}, \frac{1}{81}, \dots\}$

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

   (c) $\{\frac{1}{2}, -\frac{4}{3}, \frac{9}{4}, -\frac{16}{5}, \frac{25}{6}, \dots\}$

   (d) $\{\frac{5}{4}, -\frac{5}{2}, 5, -10, \dots\}$