# Math 100 - Week 6 Recitation (Fall 2013)

1. Each of the following sequences is given in explicit form. For each sequence, write the first five terms of the sequence, and determine the limit, if it exists.

   (a)
   $$a_n = \frac{n^4}{e^n}$$

   (b)
   $$a_n = \frac{3^n}{2^n + 10000}$$

   (c)
   $$a_n = \frac{1 \cdot 3 \cdot 5 \cdots (2n-1)}{(2n)!}$$

2. Each of the following sequences is given by the first five terms (you may assume the given pattern continues). For each sequence, find an explicit form for the sequence, and determine the limit, if it exists.

   (a)
   $$6,\ -0.6,\ 0.06,\ -0.006,\ 0.0006, \ldots$$

   (b)
   $$4,\ \left(5 - \frac{1}{2}\right)^{1/2},\ \left(5 - \frac{1}{3}\right)^{1/3},\ \left(5 - \frac{1}{4}\right)^{1/4},\ \left(5 - \frac{1}{5}\right)^{1/5}, \ldots$$

   (c)
   $$\frac{1}{3}, \frac{4}{9}, \frac{9}{19}, \frac{16}{33}, \frac{25}{51}, \ldots$$

3. Each of the following sequences is given in recursive form. For each sequence, write the first five terms of the sequence, and determine the limit, if it exists. (For part (c), assume the limit exists.)

   (a)
   $$a_1 = 9, \quad a_{n+1} = 15 - a_n$$

   (b)
   $$a_1 = 10, \quad a_{n+1} = 20 - a_n$$

   (c)
   $$a_1 = 11, \quad a_{n+1} = \sqrt{a_n + 5}$$

4. (Challenge Problem) Find two different functions $f(x)$ that both have the following properties:

   - The curve $y = f(x)$ passes through the point $(1, 0)$.
   - For any $a$ and $b$, the arclength of the curve $y = f(x)$ between the points $(a, f(a))$ and $(b, f(b))$ is
   $$\int_a^b \sqrt{4x^4 + 4x^2 + 2}\, dx.$$