Calculus II
Homework on Lecture 15

1. List the first 4 elements of the sequence.

   (a) $a_n = \dfrac{(-1)^n}{n}$.

   (b) $a_n = \dfrac{1}{n!}$.

   (c) $a_n = \cos(\pi n)$.

   (d) $a_n = \dfrac{(-1)^n}{2n+1}$.

   (e) $a_n = \dfrac{\sqrt{5}}{5}\left(\left(\dfrac{1+\sqrt{5}}{2}\right)^n - \left(\dfrac{1-\sqrt{5}}{2}\right)^n\right)$

2. List the first 5 elements of the sequence.

   (a) $a_{n+1} = \dfrac{1}{2}\left(a_n + \dfrac{3}{a_n}\right)$, $a_1 = 1$.

   (b) $a_n = a_{n-1} + a_{n-2}$, $a_1 = 1$, $a_2 = 1$.

   (c) $a_n = \dfrac{\left(\frac{1}{2} - n\right)}{n}a_{n-1}$, $a_0 = 1$.

   (d) $a_n = a_{n-1} + 2n + 1$, $a_0 = 1$.

   (e) $a_n := \dfrac{1}{n}a_{n-1}$, $a_1 = 1$.

3. Give a simple sequence formula that matches the pattern below.

   (a) $\left(1, \dfrac{1}{3}, \dfrac{1}{5}, \dfrac{1}{7}, \dfrac{1}{9}, \dots\right)$.

   (b) $\left(-1, \dfrac{1}{5}, -\dfrac{1}{25}, \dfrac{1}{125}, -\dfrac{1}{625}, \dfrac{1}{3125} \cdots\right)$

   (c) $\left(-5, 2, -\dfrac{4}{5}, \dfrac{8}{25}, -\dfrac{16}{125}, \dfrac{32}{625}, \dots\right)$

   (d) $(4, 7, 10, 13, 16, 19, \dots)$

   (e) $\left(-2, \frac{3}{4}, -\frac{4}{9}, \frac{5}{16}, -\frac{6}{25}, \frac{7}{36}, \dots\right)$

   (f) $(0, -1, 0, 1, 0, -1, 0, 1, 0, -1, 0, 1, \dots)$

4. Determine if the sequence is convergent or divergent. If convergent, find the limit of the sequence.

   (a) $a_n = n$.

   (b) $a_n = 2^n$.

   (c) $a_n = 1.0001^n$.

   (d) $a_n = 0.999999^n$.

   (e) $a_n = n - \sqrt{n+1}\sqrt{n+2}$

   (f) $a_n = \dfrac{\ln n}{n}$.

   (g) $a_n = \dfrac{\ln n}{\sqrt[10]{n}}$.

   (h) $a_n = \dfrac{1}{n}$.

   (i) $a_n = \dfrac{1}{n!}$.

   (j) $a_n = \dfrac{n^n}{n!}$.

   (k) $a_n = \cos n$.

   (l) $a_n = \cos\left(\dfrac{1}{n}\right)$

   (m) $a_n = \left(\dfrac{n+1}{n}\right)^n$.

   (n) $a_n = \left(\dfrac{2n+1}{n}\right)^n$.

   (o) $a_n = \left(\dfrac{n+1}{n}\right)^{2n}$.

   (p) $a_n = \left(\dfrac{n+1}{2n}\right)^n$.