

# Calculus II

## Homework

### Sequences

1. List the first 4 elements of the sequence.

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

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

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

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

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

2. List the first 5 elements of the sequence.

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

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

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

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

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

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

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

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

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

(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)  $a_n = \frac{\ln n}{n}$ .

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

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

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

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

(k)  $a_n = \cos n$ .

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

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

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

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

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