

Homework 12

Math 147, Fall 2023

This homework is due on Friday, November 10 (at the start of recitation). *Turn in (via Gradescope) your answers to questions 1–7.*

0. Read Sections 2.1, 2.2, and 5.7. After reading these sections, you should be able to answer the following questions (which are *not* to be turned in).

- What is a *population growth constant*?
- What is the limit of the sequence $a_n = (-\pi)^n$?
- How are the limit laws for sequences related to the limit laws for functions?

1. Determine the population growth constant for each of the following population models:

(a) $N_t = 5e^3 e^{0.2t}$

(b) $N_t = 5e^{3t} e^{0.2t}$

2. Determine if the limits of the following sequences (or if the limit does not exist, explain why not).

(a) $a_n = (-2)^n$

(b) $a_n = (-1/2)^n$

(c) $a_n = e^{-n}$

(d) $a_n = \cos(\pi n)$

(e) $a_n = \sin(\pi n)$

(f) $a_n = \frac{-n^3 - 2}{2n^2 + 6n - 12}$

(g) $a_n = 6 + \frac{\sin(\frac{\pi}{6}n)}{5 + \ln n}$

3. For the following recursions, determine all fixed points, whether they are stable, and, if so, whether they are approached with or without oscillations:

(a)

$$a_{n+1} = |a_n|$$

(b)

$$a_{n+1} = \begin{cases} -0.2a_n & \text{if } a_n \leq 0 \\ \sqrt{a_n} & \text{if } a_n > 0 \end{cases}$$

4. Section 5.3 # 22, 24, 26

5. Section 2.1 # 10, 16, 28

6. Section 2.2 # 2, 30, 90, 98
7. Section 5.7 # 2, 4, 6, 12, 14
8. (These problems are *not* to be turned in!)
 - (a) Section 5.3 # 18, 21, 22, 23, 25, 29, 30, 31
 - (b) Section 2.1 # 7, 13, 19, 25, 35, 43, 37
 - (c) Section 2.2 # 11, 29, 31, 43, 51, 91, 97, 99, 101, 103, 105, 109
 - (d) Section 5.7 # 1, 3, 7, 9, 13