

Term: Fall 2023

Name: \_\_\_\_\_

Instructor: Patricia Wrean

**MATH 156**  
**Test 3, Version A**

**Total =  $\overline{25}$**

- All of the work on this test must be your own.
- You may use a scientific calculator. You may not use a calculator with graphing capability or a smartphone app. You may not share calculators between students.

**GOOD LUCK!**

1. (2 points) Label the following as “arithmetic”, “geometric” or “neither”.

(a) 1, 2, 6, 24, ...

\_\_\_\_\_

(b) 72, 36, 18, ...

\_\_\_\_\_

2. (5 points) Consider the following.

$$a_n = 24 - 3n \quad \text{for } 3 \leq n \leq 17$$

(a) Calculate the first three terms:

\_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_

(b) Calculate the final term:

\_\_\_\_\_

(c) Give a recursive formula for  $a_n$ . Be sure to specify what values to use for the index.

Draw a box around your answer.

3. (3 points) Consider the following:

$$\sum_{n=4}^{28} 3n$$

(a) How many terms does it have? \_\_\_\_\_

(b) Evaluate the sum. Show your work below. \_\_\_\_\_

4. (3 points) Consider the following.

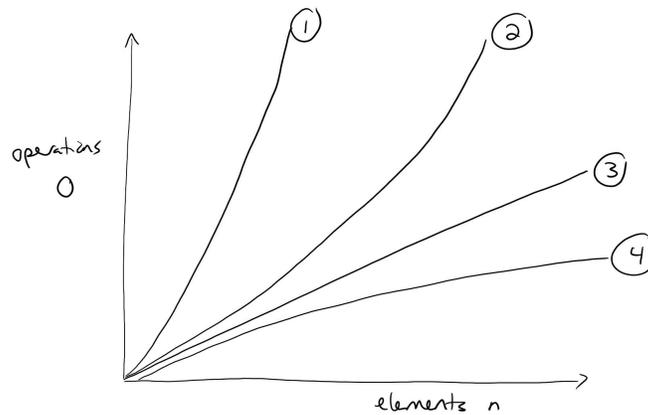
$$250 + 50 + 10 + \dots$$

(a) Is this a sequence or a series? Choose one: \_\_\_\_\_ sequence / series

(b) Calculate the sum, if it exists. If it does not exist, say so and explain briefly. Show your work below. \_\_\_\_\_

5. (3 points) Consider the arithmetic sequence with first term equal to 39 and final term equal to 225. The common difference is equal to 6. How many terms are in this sequence?

6. (2 points) Match the Big O notation with its corresponding curve on the graph. Please note that the curves are labeled 1, 2, 3, and 4 going from left to right and that curve 3 is a straight line.



- (a)  $O(n)$   
(b)  $O(n^2)$   
(c)  $O(\log n)$   
(d)  $O(n \log n)$

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7. (2 points) Evaluate the following logarithms.

(a)  $\log_{10}(0.1)$

\_\_\_\_\_

(b)  $\log_4(64)$

\_\_\_\_\_

8. (2 points) For each of the following procedures, the number of operations needed for a task of size  $n$  is given below. Find Big O for each procedure.

(a)  $3n^2 + 2n!$

\_\_\_\_\_

(b)  $(\log n)(4n + 5)$

\_\_\_\_\_

9. (3 points) For a task of size  $n$ , Program A will always take one thousand steps to run and Program B will take  $n \log n$  steps to run. Indicate whether the following statements are true or false.

(a) Program B has logarithmic growth.

True / False

(b) There are no values of  $n$  for which Program B is a more efficient choice than Program A.

True / False

(c) If you think the task might have a very, very large  $n$ , Program A is probably a good choice.

True / False