

Term: 2022

Name: _____

Instructor: Patricia Wrean

**MATH 156-X01
Practice Test 3A**

Total = $\frac{\quad}{30}$

- **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.

GOOD LUCK!

1. (4 points) Consider the following.

$$a_n = (-4)^n \quad \text{for } 0 \leq n \leq 16$$

(a) Calculate the first three terms: _____ , _____ , _____

(b) How many terms does this have? _____

2. (6 points) For each of the following,

- specify whether it is arithmetic, geometric, or neither,
- give a formula for a_n , being sure to specify what values to use for the index, and
- draw a box around your formula for a_n

(a) $5, -15, 45, \dots$

(b) $\frac{2}{1}, \frac{3}{2}, \frac{4}{3}, \frac{5}{4}, \dots, \frac{21}{20}$

3. (3 points) Write the following sum in sigma notation. You do not need to calculate the total.

$$1 + 4 + 9 + 16 + \dots + 144$$

4. (5 points) Consider the following.

$$27 + 16 + 5 + \dots$$

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

(b) Calculate the ninety-ninth term. Show your work below. _____

(c) Calculate the sum of the first ninety-nine terms. Show your work below. _____

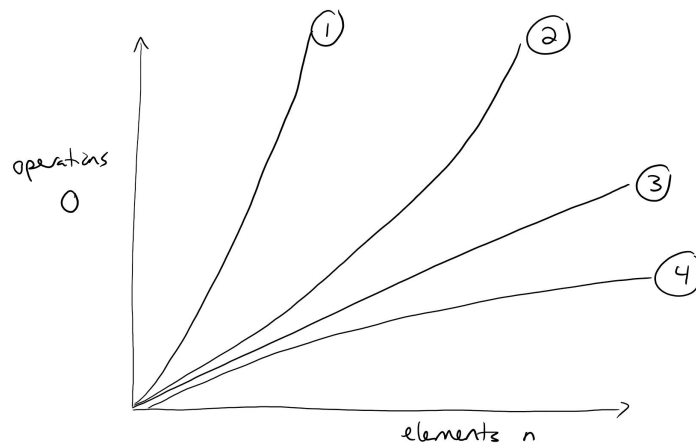
5. (3 points) Consider the arithmetic sequence with first term equal to 20 and fifteenth term equal to 104. What is the common difference for this sequence?

6. (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) $4!$

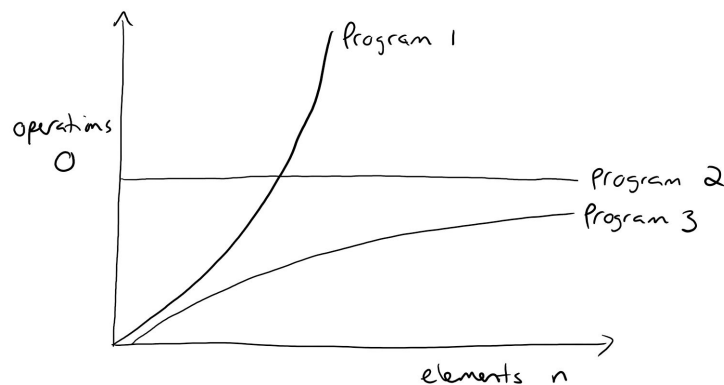
(b) $n(n + 2\log n + 3)$

7. (4 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) $O(n \log n)$ _____
- (b) $O(\log n)$ _____
- (c) $O(n^2)$ _____
- (d) $O(n)$ _____

8. (3 points) The following graph shows the number of operations O required to complete a task of size n for programs 1, 2, and 3. The number of operations required for Program 2 is a constant, so Program 2 is a horizontal straight line.



Indicate whether the following statements are true or false by selecting the correct answer.

- (a) Program 3 is always more efficient than Program 1. True / False
- (b) For very small n , Program 1 could be a better choice than Program 2. True / False
- (c) For large n , the most efficient program is Program 3. True / False