1. [3 marks] Find $6 + 2 + \frac{2}{3} + \frac{2}{9} + \ldots$

Geometric $\quad r = \frac{1}{3}$

$$S_\infty = \frac{a_m}{1-r} \qquad \text{(valid because } -1 < r < 1\text{)}$$

$$= \frac{6}{\left(1 - \frac{1}{3}\right)}$$

$$= 9$$

2. [3 marks] Write a recursive formula for the following. Remember to write down the values of the index.

$a_n = 2^n$ for $3 \le n \le 8$

$8, 16, \ldots, 256$

geometric $r = 2$

$$\begin{cases} a_3 = 8 \\ a_n = 2a_{n-1} \text{ for } 4 \le n \le 8 \end{cases}$$

Alternatively:

$$\begin{cases} a_1 = 8 \\ a_n = 2a_{n-1} \text{ for } 2 \le n \le 6 \end{cases}$$

3. [4 marks] An arithmetic sequence has $a_3 = 26$ and $d = 4$. Find n so that $a_n = 298$.

$$a_n = a_m + (n-m)d$$

$m = 3:$ $a_n = a_3 + (n-3)d$

$a_n = 298$
$a_3 = 26$ $\quad:\quad$ $298 = 26 + (n-3)(4)$
$d = 4$ $\qquad\quad 272 = \qquad 4(n-3)$
$\qquad\qquad\qquad\qquad 68 = n-3$
$\qquad\qquad\qquad\qquad 71 = n$

4. [4 marks] Find $\sum\limits_{n=3}^{17} 6n \qquad = 18 + 24 + \dots + 102$

Arithmetic $d = 6$

$k = \#$ terms
$= 17 - 3 + 1$
$= 15$

$$S_k = \frac{k}{2}(a_m + a_n)$$

$$= \frac{15}{2}(18 + 102)$$

$$= 900$$

5. [4 marks] State the order of the following expressions:

a) $8n! + 7(2^n)$

$$O(n!)$$

b) $5(2^n) + 3n^2$

$$O(2^n)$$

c) 6^2 ← does not depend on n

$$O(1)$$

d) $n(6 + 4 \log n)$

$$= 6n + 4n \log n$$

$$O(n \log n)$$

6. [3 marks] List the following from smallest to largest:
$O(2^n)$, $O(n^2)$, $O(n!)$, $O(n \log n)$

$O(n \log n)$, $O(n^2)$, $O(2^n)$, $O(n!)$

7. [2 marks] Camosun currently has 14,000 students. Camosun wants to know the ages of all current students. One hundred current student records are randomly selected and the ages of the 100 students are analyzed.

a) How many measurements are in the sample?

100

b) How many measurements are in the population?

14,000

8. [2 marks] State whether the following variables are discrete or continuous:

a) Number of times a user has reset their password

Discrete

b) Time (in seconds) it takes a user to reset their password

Continuous