Name: _____

> Answer the questions in the spaces provided on the following pages. If you run out of
> room for an answer, continue on the back of the page. Show **all** your work!

1. Write a recursive and generic formula for the following sequences

   (a) $a_n = \{1, 2, 3, 4, \ldots, n\}$

Solution:	Generic	Recursive
	$a_n = n$	$a_{n+1} = n + 1;\ \ a_1 = 1$

   (b) $a_n = \{3, 6, 9, 12, \ldots, n\}$

Solution:	Generic	Recursive
	$a_n = 3 + 3(n-1) = 3n$	$a_{n+1} = 3 + a_n;\ \ a_1 = 3$

   (c) $a_n = \{1, 3, 9, 27, \ldots, n\}$

Solution:	Generic	Recursive
	$a_n = 3^n$	$a_{n+1} = 3\,(a_n);\ \ a_1 = 1$

   (d) $a_n = \{\dfrac{1}{2}, \dfrac{1}{4}, \dfrac{1}{8}, \ldots, n\}$

Solution:	Generic	Recursive
	$a_n = \left(\dfrac{1}{2}\right)^n$	$a_{n+1} = \dfrac{1}{2}\,(a_n);\ \ a_1 = \dfrac{1}{2}$

2. Rewrite the series $\displaystyle\sum_{n=0}^{12} \frac{n+2}{3}$ to start at $n = 3$

   Solution:
   $$\sum_{n=3}^{15} \frac{n-3+2}{3} = \sum_{n=3}^{15} \frac{n-1}{3}$$

3. Rewrite the series $\displaystyle\sum_{n=5}^{20} \frac{n}{(n-1)^2}$ to start at $n = 0$

   Solution:
   $$\sum_{n=0}^{15} \frac{n+5}{(n+5-1)^2} = \sum_{n=0}^{15} \frac{n+5}{(n-4)^2}$$

4. Strip out the last term of the sum $\displaystyle\sum_{n=0}^{22} \frac{n+8}{3}$

Solution:

$$\frac{22+8}{3} + \sum_{n=0}^{21} \frac{n+8}{3} = 10 + \sum_{n=0}^{21} \frac{n+8}{3}$$

5. Rewrite the following expression as a single summation, $\displaystyle\sum_{i=0}^{k} i^3 + (k+1)^3$

Solution:

$$\sum_{n=0}^{k+1} i^3$$

6. Write the following in summation notation $\displaystyle\frac{1}{2} + \frac{2}{3^2} + \frac{3}{4^3} + \cdots + \frac{n}{(n+1)^n}$

Solution:

$$\sum_{k=1}^{n} \frac{k}{(k+1)^k}$$

7. Write the following expression as a single summation: $\displaystyle 3 * \sum_{t=1}^{p} (2t-3) + \sum_{t=1}^{p} (4-5t)$

Solution:

$$3 * \sum_{t=1}^{p} (2t-3) + \sum_{t=1}^{p} (4-5t) = \sum_{t=1}^{p} (6t-9) + \sum_{t=1}^{p} (4-5t)$$
$$= \sum_{t=1}^{p} t - 5$$