KEY

Rules for "finding" the nth term:

Fill in the following tables and answer the questions.

1. Linear (arithmetic) sequences

a.) $u_n = 3n+2$

n	1	2	3	4	5
u_n	5	8	11	14	17
1st difference		3	3	3	3
2nd difference			0	0	0

b.) $u_n = -2n+3$

n	1	2	3	4	5
u_n	1	-1	-3	-5	-7
1st difference		-2	-2	-2	-2
2nd difference			0	0	0

c.) $u_n = an+b$

n	1	2	3	4	5
u_n	a + b	2a + b	3a + b	4a + b	5a + b
1st difference		a	a	a	a
2nd difference			0	0	0

Typo

The FIRST difference in a linear sequence is always ..... constant!

2. Quadratic sequences

(Remember when we dealt with quadratic functions, we used the general form $f(x) = ax^2 + bx + c$)

a.) $u_n = n^2 + 3n + 3$

n	1	2	3	4	5
u_n	7	13	21	31	43
1st difference		6	8	10	12
2nd difference			2	2	2

b.) $u_n = -2n^2 + 3$

n	1	2	3	4	5
u_n	1	-5	-15	-29	-47
1st difference		-6	-10	-14	-18
2nd difference		-4	-4	-4	

c.) $u_n = an^2 + bn + c$

n	1	2	3	4	5
u_n	a+b+c	4a+2b+c	9a+3b+c	16a+4b+c	25a+5b+c
1st difference		3a+b	5a+b	7a+b	9a+b
2nd difference		2a	2a	2a	

The SECOND difference for a quadratic sequence is always ..... constant

PREDICT what the THIRD difference will be for a CUBIC sequence.

The THIRD difference for a cubic sequence is always..... constant!

Test your prediction with the following sequence.

3. a.) $u_n = 2n^3 + 3n^2 - 2n + 5$

n	1	2	3	4	5
u_n	8	29	80	173	320
1st difference		21	51	93	147
2nd difference		30	42	54	
3rd difference		12	12		

b.) $u_n = an^3 + bn^2 + cn + d$

n	1	2	3	4	5
u_n	a+b+c+d	8a+4b+2c+d	27a+9b+3c+d	64a+16b+4c+d	125a+25b+5c+d
1st difference	7a+3b+c	19a+5b+c	37a+7b+c	61a+9b+c	
2nd difference	12a+2b	18a+2b	24a+2b		
3rd difference	6a	6a			

Must be spacing 1?