Linear Functions

We have encountered functions such as f(x) = 3x + 2

x	f(x)
0	
1	
2	
70	
200	

We can find any term by substituting the required value of x

			....		....		
0th Term	1st Term	2nd Term	....	70th term	....	200th term	nth term

Recurrence Relations

A recurrence relation can be written as $u_{n+1} = 3u_n + 2$

If $u_2 = 14$ what is u_3 ?

$u_3 = 3u_2 + 2$

$u_3 = 3(14) + 2$

$u_3 = 44$

If $u_2 = 14$ what is u_1 ?

$u_2 = 3u_1 + 2$

$14 = 3u_1 + 2$

$12 = 3u_1$

$u_1 = 4$

		14			....	
0th Term	1st Term	2nd Term	3rd Term	4th term	....	10th term
u_0	u_1	u_2	u_3	u_4		u_{10}

By using a similar approach, complete this table.

1 Find each of the missing terms in this table

Recurrence Relation	U_0	U_1	U_2	U_3
$u_{n+1} = 5u_n$		5		
$u_{n+1} = \frac{1}{2}u_n$	1			
$u_{n+1} = 2u_n + 1$			9	
$u_{n+1} = 3u_n - 2$				1
$u_{n+1} = 0.25u_n + 1$	4			
	4	11	25	53

1 Evaluate each of the following recurrence relations, using the given starting point each time

$u_{n+1} = \frac{1}{2}u_n + 7$

u_0	7
u_1	
u_2	
u_3	
u_4	
u_5	
u_6	
u_7	
u_8	

u_0	-10
u_1	
u_2	
u_3	
u_4	
u_5	
u_6	
u_7	
u_8	

u_0	
u_1	
u_2	
u_3	
u_4	
u_5	
u_6	
u_7	
u_8	

<— You chose the staring value

$u_{n+1} = -\frac{1}{4}u_n + 10$

u_0	60
u_1	
u_2	
u_3	
u_4	
u_5	
u_6	
u_7	
u_8	

u_0	-50
u_1	
u_2	
u_3	
u_4	
u_5	
u_6	
u_7	
u_8	

u_0	
u_1	
u_2	
u_3	
u_4	
u_5	
u_6	
u_7	
u_8	

<— You chose the staring value

$u_{n+1} = -0.35u_n - 4$

u_0	60
u_1	
u_2	
u_3	
u_4	
u_5	
u_6	
u_7	
u_8	

u_0	-200
u_1	
u_2	
u_3	
u_4	
u_5	
u_6	
u_7	
u_8	

u_0	
u_1	
u_2	
u_3	
u_4	
u_5	
u_6	
u_7	
u_8	

<— You chose the staring value