

## Recurrence Relation - Exercise (1 page; 13/7/20)

Consider the sequence defined by  $u_n = au_{n-1} + b$ ,

where  $a$  &  $b$  are real constants, and  $u_0$  is given.

(i) What familiar sequences are special cases of this sequence?

(ii) Define a new sequence by  $v_n = u_n + c$

For what value of  $c$ , in terms of  $a$  &  $b$ , will  $v_n$  be a geometric sequence?

For what value of  $a$  does this not work?

(iii) If  $u_n = 2u_{n-1} + 3$ , and  $u_0 = 4$ , find a formula for  $u_n$  in terms of  $n$

(iv) Find a similar formula for  $u_n = au_{n-1} + b$ , where  $u_0$  is given.

(v) Under what conditions will  $u_n$  be constant? Give a non-trivial example.