Induction – Q16 [Practice/E] (18/6/23)

If $u_{n+1} = 3u_n - 2^n$, where $u_1 = 5$, then $u_n = 2^n + 3^n$

Solution

[Show that the result is true for $n = 1$]

Now assume that the result is true for $n = k$,

so that $u_k = 2^k + 3^k$

Then $u_{k+1} = 3u_k - 2^k = 3(2^k + 3^k) - 2^k$

$= (3 - 1)2^k + 3^{k+1}$

[this avoids writing down the last line straightaway - as it's effectively a 'show that' result]

$= 2^{k+1} + 3^{k+1}$

[Standard wording]