

Day 4 (July 2, 2017)

Find a closed form for the sequence with starting data $\begin{bmatrix} 5 \\ 34 \end{bmatrix}$ satisfying $f(n) = 12f(n-1) - 20f(n-2)$.

n	$f(n)$
0	5
1	34
2	308
3	3016
4	30032
5	300064

Looks like there are powers of 10 and 2 going on.

looks like $3 \cdot 10^n$

Looks like there are two bases involved.
If you didn't know the two bases, you can
Try starting with 1 and k .

n	$f(n)$
0	1
1	k
2	$12k - 20 = k^2$

if this is really exponential, then...

\Rightarrow roots $k = 2, 10$

So the closed form should look like $f(n) = A \cdot 2^n + B \cdot 10^n$

To find A, B :

$$n=0 \rightarrow f(0) = 5 = A \cdot 2^0 + B \cdot 10^0$$

$$n=1 \rightarrow f(1) = 34 = A \cdot 2^1 + B \cdot 10^1$$

$$\left. \begin{array}{l} A + B = 5 \\ 2A + 10B = 34 \end{array} \right\} \Rightarrow A = 2, B = 3$$

$$\therefore f(n) = 2 \cdot 2^n + 3 \cdot 10^n$$