Answer on Question #60835 – Math – Discrete Mathematics

Question

a) Find the solution of the difference equation yk+2 − 4yk+1 + 4yk =0 ;0 k =K ,1,0. Also find the particular solution when y0 =1 and y1 =6 .

Solution

The auxiliary equation for the homogeneous difference equation

$$y_{k+2} - 4y_{k+1} + 4y_k = 0 \qquad (1)$$

is

$r^2 - 4r + 4 = 0 \ \ or \ \ (r-2)^2 = 0.$

Therefore, the general solution of the difference equation (1) is given by

$$y_k = A2^k + Bk2^k.$$

To find the particular solution of (1) we should find constants A and B using the conditions

$$y_0 = 1, \qquad y_1 = 6.$$

So

$$\begin{cases} A * 2^0 + B * 0 * 2^0 = 1 \\ A * 2^1 + B * 1 * 2^1 = 6 \end{cases} \rightarrow \ A = 1, \ B = 2.$$

Thus, the particular solution is

$$y_k = 2^k + 2 * k2^k = 2^k(2k+1).$$

Answer: $y_k = A2^k + Bk2^k; y_k = 2^k(2k+1).$