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[1]: # Mahdi Anvari 610700002
     # Bioinformatics first homework
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1 Question

$$T(n) = \begin{cases} T(n-1) + T(n-2); n > 2 \\ 1; n = 2 \\ 1; n = 1 \end{cases}$$

2 Answer

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$$T(n) = \begin{cases} T(n-1) + T(n-2) \; ; \; n > 2 \\ 1 \qquad\qquad ; \; n = 2 \\ 1 \qquad\qquad ; \; n = 1 \end{cases}$$

$$C_n T(n) + C_{n-1} T(n-1) + \text{ooo} + C_{n-k} T(n-k) = f(n) \; ; \; n \geq K$$

$$K = 2 \; , \; f(n) = 0 \longrightarrow C_n T(n) + C_{n-1} T(n-1) + C_{n-2} T(n-2) = 0$$

$$T(n) = Cr^n \longrightarrow C_n Cr^n + C_{n-1} Cr^{n-1} + C_{n-2} Cr^{n-2} = 0 \longrightarrow$$

$$C_n r^2 + C_{n-1} r + C_{n-2} = 0$$

$$T(n) = T(n-1) + T(n-2) \longrightarrow r^2 - r - 1 = 0 \longrightarrow r = \frac{1 \pm \sqrt{5}}{2}$$

$$T(n) = C_1 r_1^n + C_2 r_2^n \longrightarrow T(n) = C_1 \left(\frac{1+\sqrt{5}}{2}\right)^n + C_2 \left(\frac{1-\sqrt{5}}{2}\right)^n$$

$$* \; n = 1 \longrightarrow 1 = C_1 \left(\frac{1+\sqrt{5}}{2}\right)^1 + C_2 \left(\frac{1-\sqrt{5}}{2}\right)^1$$

$$n = 2 \longrightarrow 1 = C_1 \left(\frac{1+\sqrt{5}}{2}\right)^2 + C_2 \left(\frac{1-\sqrt{5}}{2}\right)^2 \longrightarrow$$

$$1 = C_1 \left(\frac{6+2\sqrt{5}}{4}\right) + C_2 \left(\frac{6-2\sqrt{5}}{4}\right) \longrightarrow$$

$$* \; C_1(3+\sqrt{5}) + C_2(3-\sqrt{5}) = 2 \longrightarrow C_1 = \frac{1}{\sqrt{5}} \; , \; C_2 = -\frac{1}{\sqrt{5}}$$

$$\Longrightarrow T(n) = \frac{1}{\sqrt{5}} \left(\frac{1+\sqrt{5}}{2}\right)^n - \frac{1}{\sqrt{5}} \left(\frac{1-\sqrt{5}}{2}\right)^n$$

————— *Shokofe* —————