3)

$$y_{n+1} = a\, y_n + b\, y_{n-1}$$

$$y_0 = \begin{pmatrix} 1 \\ 1 \end{pmatrix} \quad \text{, first define matrix form :}$$

$$\begin{pmatrix} y_{n+1} \\ y_n \end{pmatrix} = \begin{pmatrix} a & b \\ 1 & 0 \end{pmatrix} \begin{pmatrix} y_n \\ y_{n-1} \end{pmatrix}$$

$$J = \begin{pmatrix} \dfrac{a}{2} - \dfrac{\sqrt{a^2+4b}}{2} & 0 \\[4mm] 0 & \dfrac{a}{2} + \dfrac{\sqrt{4b+a^2}}{2} \end{pmatrix}$$

$\longrightarrow$ Basically depending on the sign of "a", we get different fixed points and dominating factors., so led us say :

$a > 0$:

$$\left(\dfrac{\dfrac{a + \sqrt{a^2+4b}}{2\sqrt{a^2+4b}}}{\dfrac{1}{\sqrt{a^2+4b}}} \right) = \dfrac{a}{2} + \sqrt{\dfrac{a^2+4b}{2}}$$

if $a < b$: $= \dfrac{a}{2} - \sqrt{\dfrac{a^2+4b}{2}}$