```
> restart: with(LinearAlgebra):
> # First we define the relationship as matrix
> A := Matrix([[a, b], [1, 0]])
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$$A := \begin{bmatrix} a & b \\ 1 & 0 \end{bmatrix} \tag{1}$$

```
> J, Q := JordanForm(A, output = ['J','Q'])
```

$$J, Q := \begin{bmatrix} \frac{a}{2} - \frac{\sqrt{a^2+4b}}{2} & 0 \\ 0 & \frac{a}{2} + \frac{\sqrt{a^2+4b}}{2} \end{bmatrix}, \begin{bmatrix} \frac{\sqrt{a^2+4b}-a}{2\sqrt{a^2+4b}} & \frac{a+\sqrt{a^2+4b}}{2\sqrt{a^2+4b}} \\ -\frac{1}{\sqrt{a^2+4b}} & \frac{1}{\sqrt{a^2+4b}} \end{bmatrix} \tag{2}$$

```
> result := Q . MatrixPower(J, n) . MatrixInverse(Q) . Vector([1, 1]):
> limit_ := simplify(result[1]/result[2])
```

$$limit\_ := \left(\left(\sqrt{a^2+4b} - a - 2b\right) \left(\frac{a}{2} - \frac{\sqrt{a^2+4b}}{2}\right)^n + \left(\sqrt{a^2+4b} + a + 2b\right) \left(\frac{a}{2} + \frac{\sqrt{a^2+4b}}{2}\right)^n \right) \Big/ \left(\left(\sqrt{a^2+4b} + a - 2\right) \left(\frac{a}{2} - \frac{\sqrt{a^2+4b}}{2}\right)^n - \left(\frac{a}{2} + \frac{\sqrt{a^2+4b}}{2}\right)^n \left(a - \sqrt{a^2+4b} - 2\right) \right) \tag{3}$$

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> limit(limit_, n = infinity)
```

$$\lim_{n \to \infty} \left(\left(\sqrt{a^2+4b} - a - 2b\right) \left(\frac{a}{2} - \frac{\sqrt{a^2+4b}}{2}\right)^n + \left(\sqrt{a^2+4b} + a + 2b\right) \left(\frac{a}{2} + \frac{\sqrt{a^2+4b}}{2}\right)^n \right) \Big/ \left(\left(\sqrt{a^2+4b} + a - 2\right) \left(\frac{a}{2} - \frac{\sqrt{a^2+4b}}{2}\right)^n - \left(\frac{a}{2} + \frac{\sqrt{a^2+4b}}{2}\right)^n \left(a - \sqrt{a^2+4b} - 2\right) \right) \tag{4}$$

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>
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