

$$\begin{aligned} a^n + b^n &= (a+b)(a^{n-1} + b^{n-1}) - ab^{n-1} - ba^{n-1} \\ &= (a+b)(a^{n-1} + b^{n-1}) - ab(a^{n-2} + b^{n-2}) \end{aligned}$$