

Solution (#346) We have that $F_{n+m+1} = F_n F_m + F_{n+1} F_{m+1}$ and so setting $m = n$ we have

$$F_{2n+1} = (F_{n+1})^2 + (F_n)^2.$$

Hence

$$F_{2n} = F_{2n+1} - F_{2n-1} = \left\{ (F_{n+1})^2 + (F_n)^2 \right\} - \left\{ (F_n)^2 + (F_{n-1})^2 \right\} = (F_{n+1})^2 - (F_{n-1})^2.$$