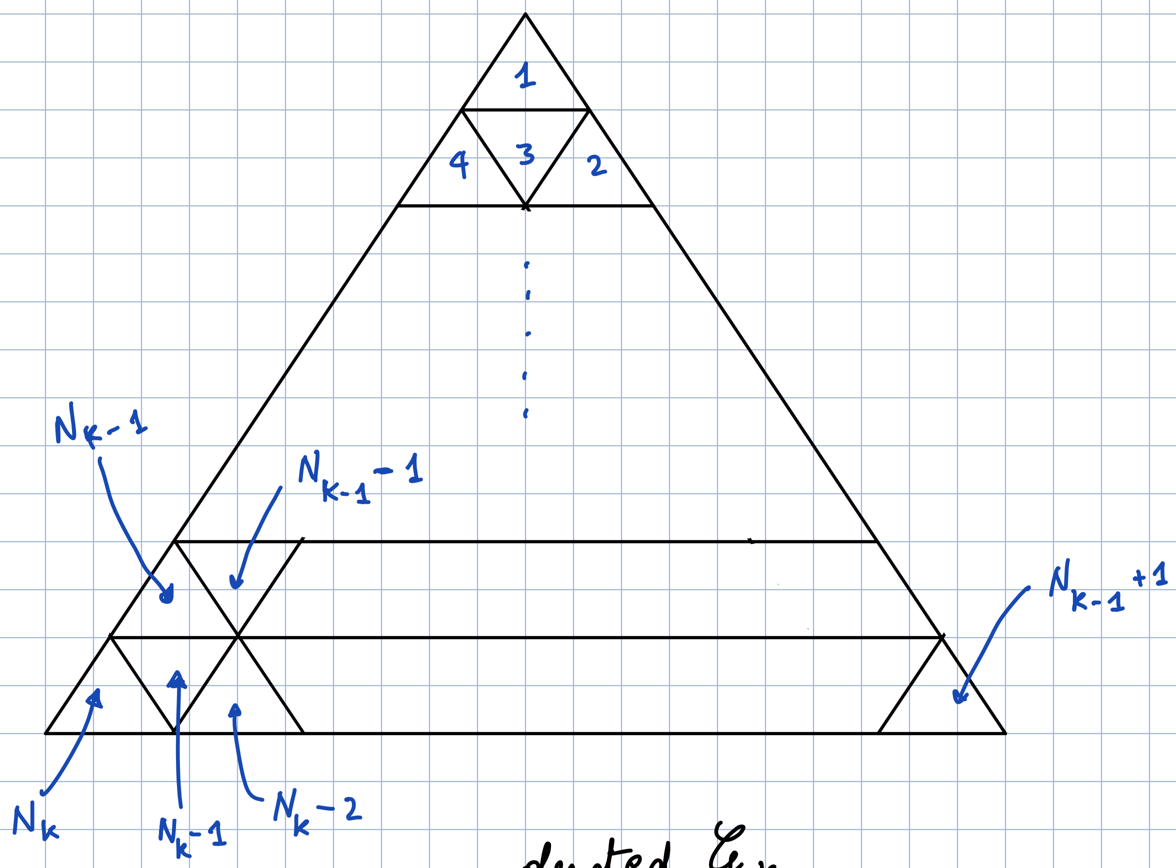

The above graph of triangles, denoted $\mathcal{G}_k$, has k levels. For example, level 2 consists of the triangles labelled 2, 3, 4.

Let N_k = number of triangles in $\mathcal{G}_k$.

Lemma For any $k \in \mathbb{N}$, $N_k = k^2$.

Proof To be written.

Now, let A_k be the adjacency matrix of $\mathcal{G}_k$.

Let B_k be the $k^2 \times (2k+1)$ matrix with entries

$$b_{pq} = \begin{cases} 1 & \text{if } p = (k-2)^2 + j \text{ for some odd } j \\ & \ \ \& \ \ q = (k-1)^2 + j + 1 \quad \text{between } 1 \ \& \ 2k-1 \\ 0 & \text{otherwise} \end{cases}$$

Finally, let C_k be the $(2k+1) \times (2k+1)$ matrix with entries $c_{i,i+1} = c_{i-1,i} = 1$ and 0 otherwise.

Conjecture For any $k \in \mathbb{N}$,

$$A_{k+1} = \left(\begin{array}{c|c} A_k & B_k \\ \hline B_k^t & C_k \end{array}\right).$$

Proof (?)