**P1**

\[ K_{2k-1, n} \]

**P2**

![Diagram](image)

These are trees with dotted lines, could be size vertex, or could have path between them (which increases cycle size or a subgraph).

(Subgraph cycle has at least 4r vertices)

**P3**

\[ (K_{k-1}) \]

**P4**

\[ p + q = 5 \Rightarrow \text{wlog} \]

Pick a \( x \in K_5 \) s.t. \( xw, xy, xz \) as 4r.

**P5**

\[ \text{(as before)} \]

Contract / choice of partition.

**P6**

Pick a neighbor of \( w \) get a \( K_5 \).

Other two neighbors together w/ \( v \) call a new \( K_5 \).

Swap \( K_5, 1 \times K_4 \) for \( K_5, K_4 \).

![Diagram](image)

ucked down to get \( r \)-cycle now.)
Note a cycle plus a across an edge gives slightly larger cycle

\[ \text{cycles of length } r. \]

Where can common neighbours go? Can be lost internally (cycles could be cliques). Could also have \( \frac{1}{2} |C_1| \) common neighbours of \( xy \) with \( C_2 \)

The rest are in the copies of cycles of length \( r \).

Sup \( r, |C_1|, |C_2| \) \( \Rightarrow \) for \( |C_1| + 1, \frac{1}{2} |C_2| + r - |C_1| = r \).
07. \[ q = r - 1 \]

However, could get

\[ o \in S \cap T \]

for all cycles.

(Can avoid this problem if we place an upper bound on acceptable \( q \) - we need to do this in one special case.)

P8

Still need 2 vertices from degree \( 4 \) cycle.

No \( k \geq 4 \) cycles here.

But \( \delta = 2k \), so \( d(k) \to 4k-1 \)

as \( n \to \infty \).

P9

Any cycle has half its vertices (matched up) in degre, or else less were then half an independent set; but \( \geq \frac{1}{2} \) entries include 0's adjacent.

\[ \delta = \frac{r+1}{2} k - 1, \quad d(k) \to 2 \frac{r+1}{2} k - 2 \quad \text{as} \quad n \to \infty. \]

\( 2 \frac{r+1}{2} k = r + 1, \quad r \text{ odd} \)

(P9 a generalisation of P2, better than P8 generalisation of degree cycles of \( K_2 \)'s).