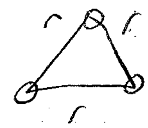
Stowe Symon

15 ok
16 ok

HW due Feb 15

(15) prove $17 \to (3)^2_3$

ok ~~if~~ K_{17} color edges with 3-colors red, green, blue -

then there is a triangle K_3 

→ Choose a point p. P has 16 edges connected to it. If each edge is red, green, or blue, then either #red > 5, #blue > 5, or #green > 5 since if each was only 5 we would only have 15 edges & we have 16. (pidgeon hole thm)

→ suppose that red is the color with 6 edges meeting p. Consider the 6 points a, b, c, d, e, f that the red edges connect to, & the edges connecting a, b, c, d, e, f with eachother, respectively.

→ if 1 of these edges is red say a-b, we have a red triangle a-b-p.

→ if not, we have K_6 with 2 colors (g, b).

→ by the pidgeon hole principle, point a (with 5 edges to b, c, d, e, f respectively) has either at least 3 g or at least 3 b

→ suppose a has 3 g edges, a-b, a-c, a-d

→ if any of the edges b-c, b-d, c-d are g, we have a green triangle with point a

→ if not, all 3 are green & we have green triangle b-c-d

→ thus, we must have either a green or blue triangle

→ The same holds true if a has 3 b edges

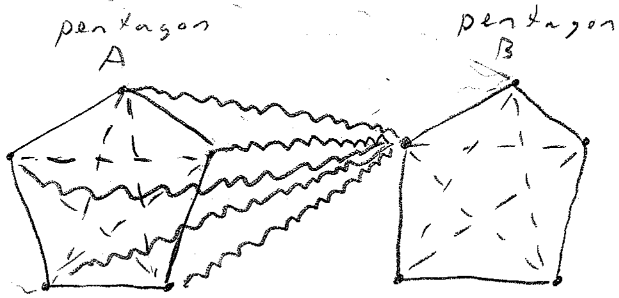
→ Thus, we are guaranteed a red, green, or blue triangle

→ The same arg't holds true if green or blue is the color with 6 edges meeting p

(16) $10 \not\to (3)^2_3$

OK

counter example: - - - = red edge, —— = blue, ~~~ = green



-> continue connecting B + A with green edges (not drawn, to keep drawing clear)

-> neither pentagon has a 1 color K_3. If we connect the pentagons together with green edges (neither has a green edge inside), all points are connected & there are no 1 color K_3;

EC ~~Up to _ permutes of vertices, this is only counter example~~