TW 314 (Applied Discrete Mathematics)

Tutorial 06: 9 March 2017

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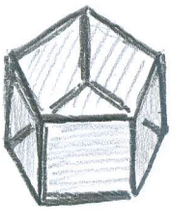
1. Let P be the prism constructed from five squares and two regular pentagons.

   (a) Draw the plane graph G of the prism P.

   (b) Let G^* be the dual of G.

      i. How many edges does G^* have?

      ii. For $i = 3, 4, 5 \ldots$ how many vertices of degree i does G^* have?

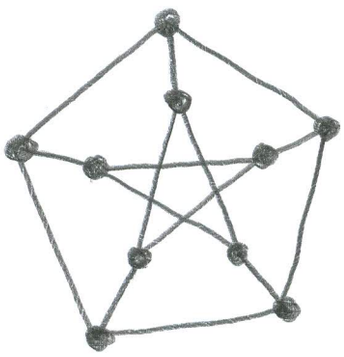
      iii. For $i = 3, 4, 5 \ldots$ how many regions of degree i does G^* have?

2. Show that $K_{2,2}$ is a subdivision of K_3.

3. Use Kuratowski's theorem to show that the Petersen graph is non-planar.

4. Use Kuratowski's theorem to show that $K_3 \times K_3$ is non-planar.

5. **(optional, a challenge)** Modify the proof of the Five Colour Theorem in an attempt to prove the Four Colour Theorem. If your attempt is unsuccessful, try to explain why.



The Petersen graph