

Math 4550 HW due April 9, 2009

1. Find two nonisomorphic graphs G_1 and G_2 (without loops or multiple edges) such that $p_{g_1}(t) = p_{g_2}(t)$. Two graphs are isomorphic if there is a bijection ϕ between their vertices such that ϕ and ϕ^{-1} maps edges to edges.
2. Let $\mathcal{A} = \{H_1, H_2, \dots, H_6\}$ be the following hyperplanes in \mathbb{R}^3 .

$$\begin{aligned} H_1 &= \{x - 2y + 3z = 0\} & H_2 &= \{x + y + z = 0\} & H_3 &= \{y + 2z = 0\} \\ H_4 &= \{x + 4y + 6z = 0\} & H_5 &= \{x + 2y + 5z = 0\} & H_6 &= \{2y + z = 0\}. \end{aligned}$$

How many highest dimensional cones are there in this hyperplane arrangement?

3. A hyperplane arrangement $\mathcal{A} = \{H_1, \dots, H_n\}$ in \mathbb{R}^d is *generic* if for any $k \leq d$ and k distinct hyperplanes $\{H_{i_1}, \dots, H_{i_k}\}$ of \mathcal{A}

$$\dim \left(\bigcap_{j=1}^k H_{i_j} \right) = d - k.$$

Determine the number of largest dimensional cones in any generic hyperplane arrangement.