Linear Programming 2023 (EPFL): Problem set of week 2

March 1, 2024

1. Show that the three medians in a triangle with vertices v_1, v_2, and v_3 meet at the point $\frac{1}{3}(v_1 + v_2 + v_3)$.

2. Find the hyperplane passing through $(1, 1, 1)$ that is perpendicular to both hyperplanes $\{x + 2y + z = 2\}$ and $\{x - y - 3z = 8\}$ in $\mathbb{R}^3$.

3. Find the closest point to $(3, 5, 4)$ on the hyperplane $\{2x + 4y - z = 3\}$ in $\mathbb{R}^3$.

4. Find the distance of the origin O to the line of intersection of the hyperplanes $\{x + y + z = 1\}$ and $\{2x - y + 3z = 1\}$ in $\mathbb{R}^3$.

5. Find a point that is inside the tetrahedron whose facets are: $\{x+y+z = 1\}, \{2x-3y-z = 2\}, \{x-3y+z = 4\}$, and $\{2x-y+3z = 1\}$.