

Assignment no. 1

3 March 2020 – 15 March 2020

1. **2pts** Consider a scene with a light source \mathcal{L} , a plane ρ and a planar parallelogram $ABCD$. Denote by $A'B'C'D'$ the shadow of the parallelogram $ABCD$ in the plane ρ cast by \mathcal{L} . We know, that the shadows of the corners are computed as follows:

$$A = (-1, -2, -3)^\top \mapsto (-1, -1, -1)^\top = A',$$

$$B = (-1, -4, -1)^\top \mapsto (-1, -5, 3)^\top = B',$$

$$C = (1, -4, -3)^\top \mapsto (3, -5, -1)^\top = C'.$$

- (a) Compute the coordinates of the corner D and its shadow D' .
- (b) Determine the parameters of the light source \mathcal{L} . What type of light source is \mathcal{L} ? Support your statement with arguments.
- (c) Tell the general equation of the projection plane ρ .
2. **2pts** Consider a triangle $\triangle KLM$, where

$$K = (0, 0, 0)^\top, L = (-5, 5, 1)^\top, M = (5, -5, 2)^\top,$$

and a sphere \mathcal{S} centred at the point $C = (0, 0, 1)^\top$ with the radius $r = 3$. Decide if the points $P = (-1, 1, 2)^\top, Q = (1, -1, 1)^\top, R = (0, 0, 1)^\top$ and $S = (2, 2, 0)^\top$ lie inside the intersection $\triangle KLM \cap \mathcal{S}$. Support your decision with arguments.

To obtain maximum points, include all your computations, comment them richly and illustrate them with pictures, where necessary.

Your solution may be submitted on the practice lessons or sent by email as a camera shot with sufficiently large resolution and sharpness.