Q1: In the 3D space, assuming that the line passes through the point (x1, y1, z1) and (x2, y2, z2), please describe the formula of the line in 3D space.

**Solution:**

Assuming: -;-; -;

**Vector Form**

(,,)=(,,)+ (a,b,c)

**Parametric Form**  
 =+

=+

=+

**Symmetric Form**

Q2: Show that the perspective projection of a line in 3D is still a line on the image plane.

**Solution:**

As indicated in Solution to Q1, each point = (, , ) of a line in 3D can be represented as

(1)

where and are the slope, and and are the intercept. After perspective projection with focal length equal to f, assuming is the corresponding point of point in the image plane, then based on the similar triangle rule, we have

, y = (2)

Based on equation (1) and (2), we have

(3)

- (4)

As such, we have

🡪 🡪 (5)

As we can see it represents a line with slope and intercept .