# Photogrammetric Computer Vision
# Exercise 01

**Group 18(G_18):**

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## Part 1: Theory

**1. You would like to compute the connecting line between two 2D points. What happens, if the two points are identical?**

**Answer:**

This line will not be existed.

If these two points are identical(the homogeneous coordinates are $\begin{bmatrix} a \\ b \\ m \end{bmatrix}$),

Then the connecting line should be $\begin{bmatrix} a \\ b \\ m \end{bmatrix} \text{X} \begin{bmatrix} a \\ b \\ m \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$ which is impossible

So it is not possible to draw a line with identical points

**2. Where does the general line x cos φ + y sin φ = d intersect the line (0, 0, 1)T given in homogeneous coordinates? How can this point be interpreted?**

**Answer:**

Intersection of two lines is given as p= u1 x u2.

Then the homogeneous coordinates of the point where these two line intersect can be caculate as:

$$\begin{bmatrix} \cos \varphi \\ \sin \varphi \\ -d \end{bmatrix} X \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} = \begin{bmatrix} \sin \varphi \\ -\cos \varphi \\ 0 \end{bmatrix}$$ which is an ideal point.

So these two lines intersect a point at infinity.

**3. Show that the horizon is a straight line by showing that three points on the horizon are always collinear.**

**Answer:**

Random three points on the horizon can be represented as

P1=[a1 b1 0]T, P2=[a2 b2 0]T, P3=[a3 b3 0]T .

Because det [P1 P2 P3] = $\begin{bmatrix} a1 & a2 & a3 \\ b1 & b2 & b3 \\ 0 & 0 & 0 \end{bmatrix}$ = 0 .

Means these three points are collinear,

So the horizon is a straight line.