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

If two points are identical, the line connecting them will be (0, 0, 0), which doesn’t exist in homogeneous space.

1. 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?

The general line ax + by + c = 0 intersects the line at infinity (0, 0, 1)^T at point (b, -a, 0), which is the point at infinity. It makes sense because a general line intersects the line at infinity at infinity.

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

* Three points on horizon are denoted as p1 = (x1,y1, 0), p2 = (x2,y2,0), p3 = (x3,y3,0)
* The line connecting p1 and p2 is: l = p1xp2 = (0,0, -(x1\*y2-x2\*y1))
* It can be seen that p3 also lies on l because dot(l, p3) = 0