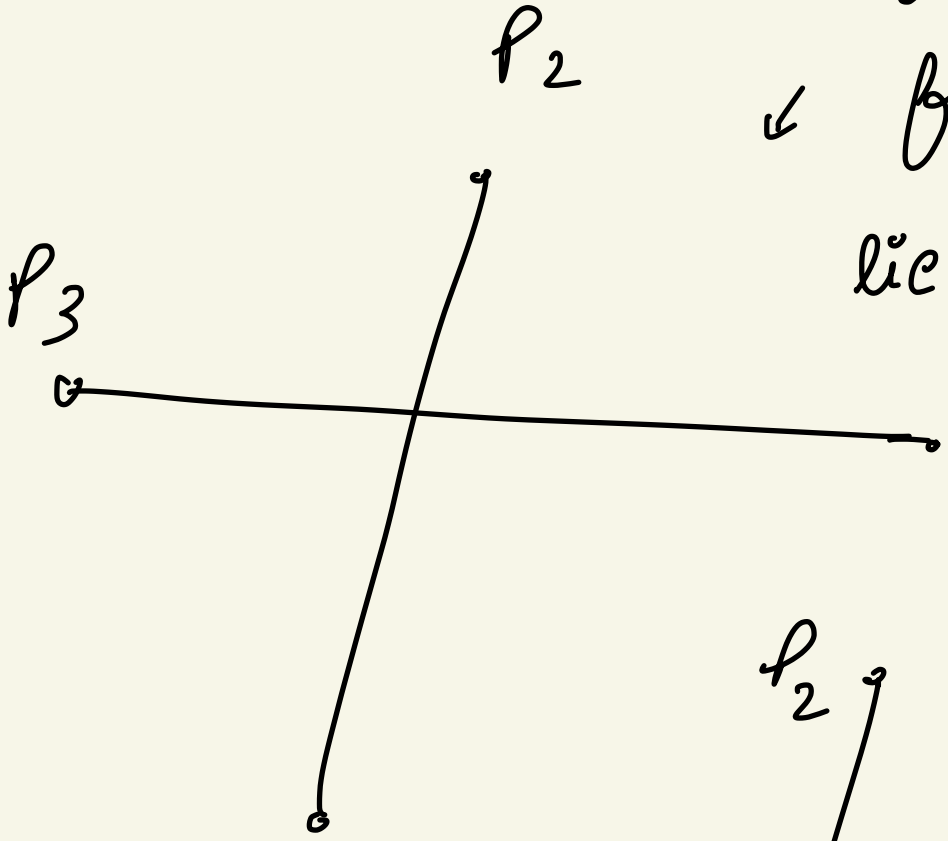
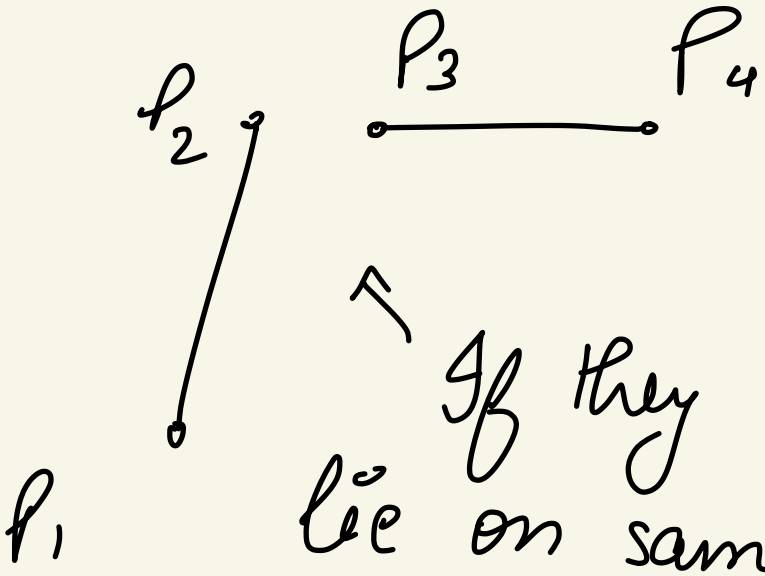
Case-I If P_1P_2 & P_3P_4 are not parallel

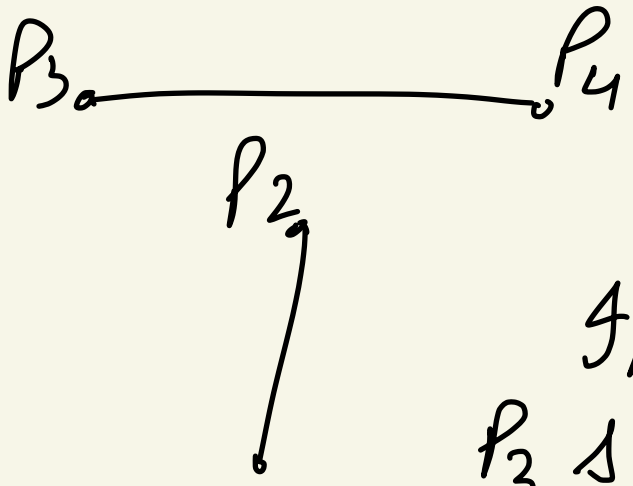
In case they are intersecting for line P_1P_2 & P_3 & P_4 would lie on opposite sides





If they lie on same side then non-intersection

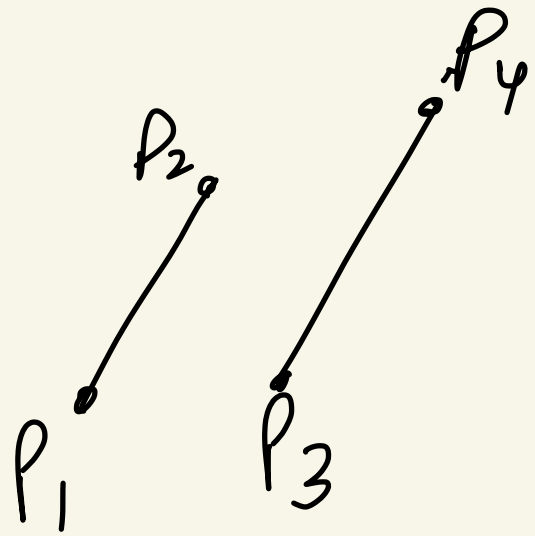
what if



In this case P_3 & P_4 are on opposite of P_2

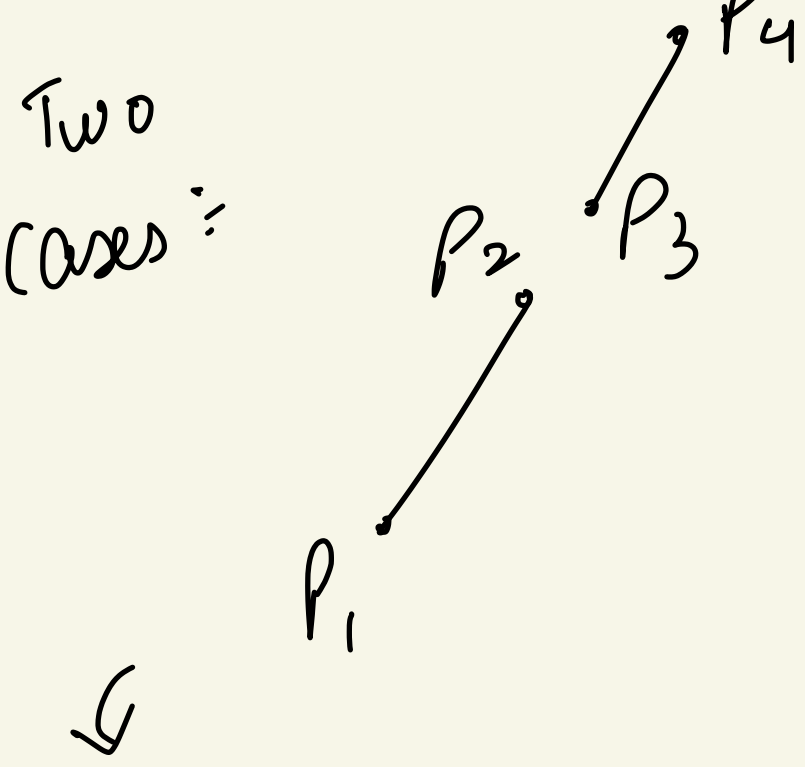
So we have to check for P_3P_4 line also, P_1 & P_2 should lie on the opposite side.

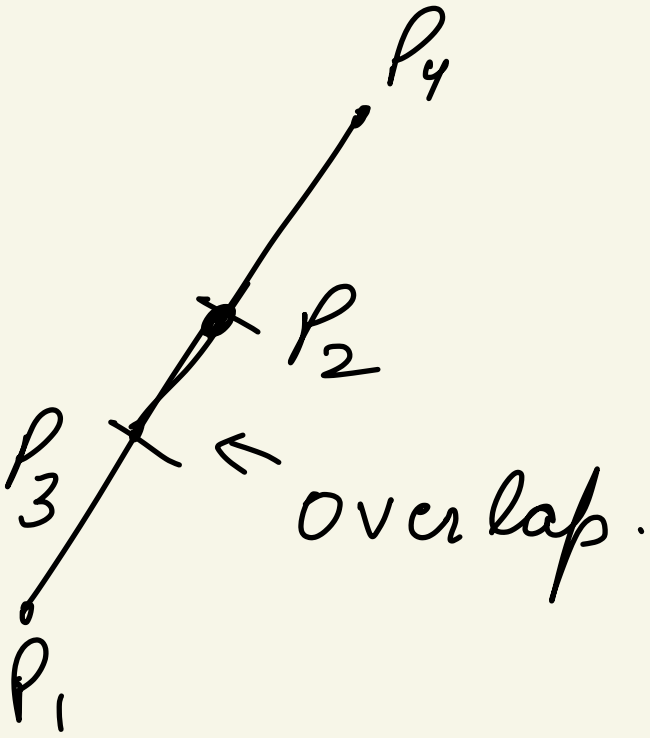
Case - II when $P_1P_2 \parallel P_3P_4$.



If they are //, P_3 or P_4 must lie on the line P_1 P_2.

Two cases:

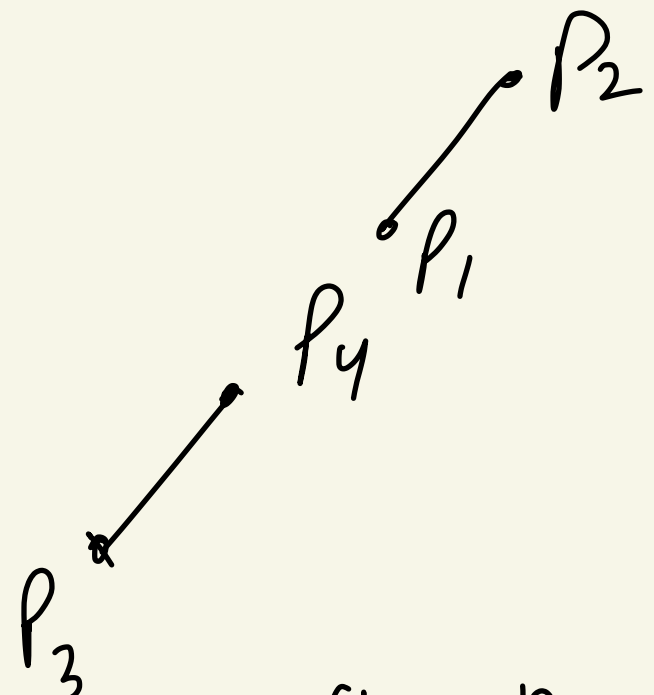




$$\max(p_1.x, p_2.x) < \min(p_3.x, p_4.x)$$

$$\max(p_1.y, p_2.y) < \min(p_3.y, p_4.y)$$

Now consider case



$$\max(p_1.x, p_2.x) < \min(p_3.x, p_4.x)$$

$$\max(p_1.y, p_2.y) < \min(p_3.y, p_4.y)$$

In this case, these conditions won't catch no-intersection.

So, we swap(p_1, p_3)
swap(p_2, p_4)
& and then check.