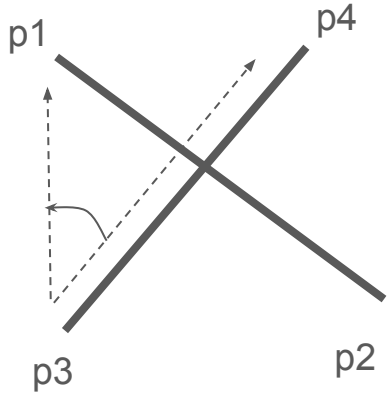


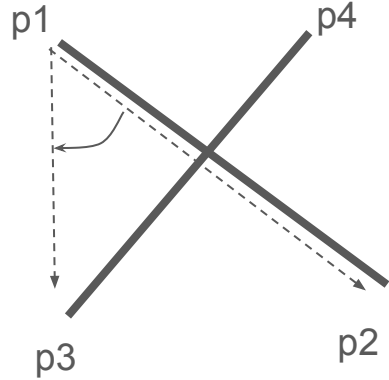
Line-Segment Intersection

When $d1$ & $d2$ have opposite signs, and $d3$ & $d4$ have opposite signs, there is an intersection.



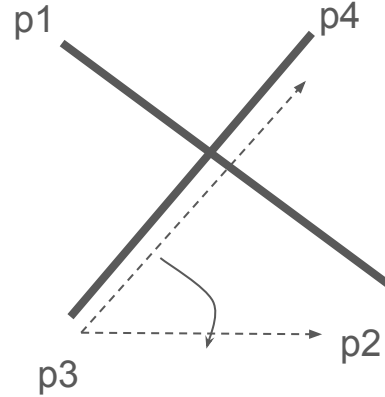
$$d1 = (p1 - p3) \times (p4 - p3) < 0$$

(counterclockwise)



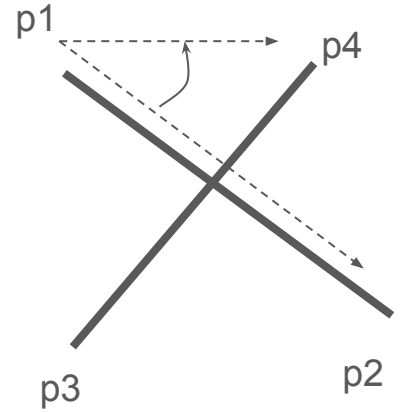
$$d3 = (p3 - p1) \times (p2 - p1) > 0$$

(clockwise)



$$d2 = (p2 - p3) \times (p4 - p3) > 0$$

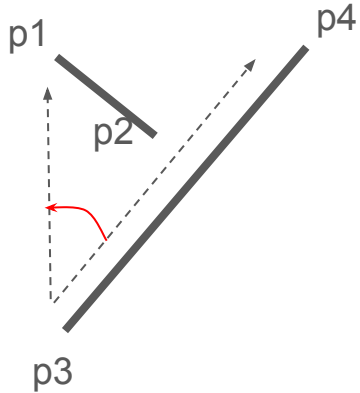
(clockwise)



$$d4 = (p4 - p1) \times (p2 - p1) < 0$$

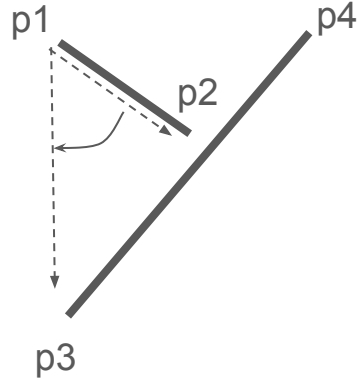
(counterclockwise)

d1 & d3 have the same size, so there is no intersection



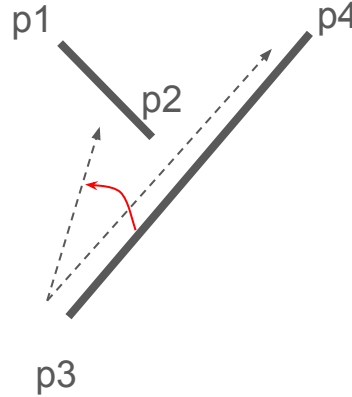
$$\mathbf{d1} = (\mathbf{p1} - \mathbf{p3}) \times (\mathbf{p4} - \mathbf{p3}) < 0$$

(counterclockwise)



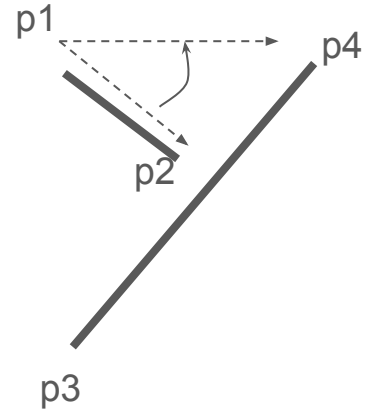
$$\mathbf{d3} = (\mathbf{p3} - \mathbf{p1}) \times (\mathbf{p2} - \mathbf{p1}) > 0$$

(clockwise)



$$\mathbf{d2} = (\mathbf{p2} - \mathbf{p3}) \times (\mathbf{p4} - \mathbf{p3}) < 0$$

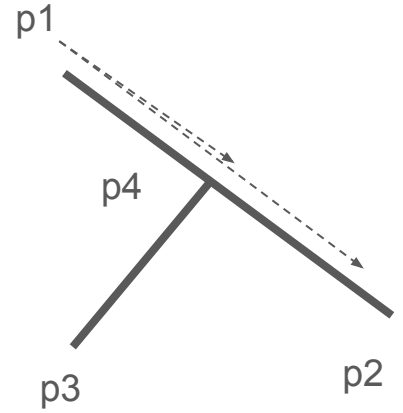
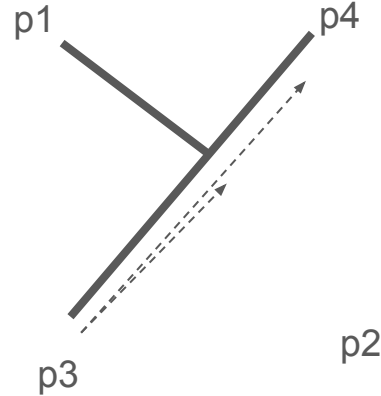
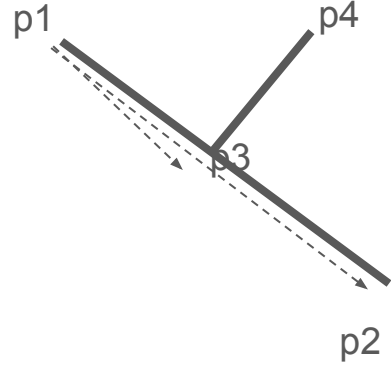
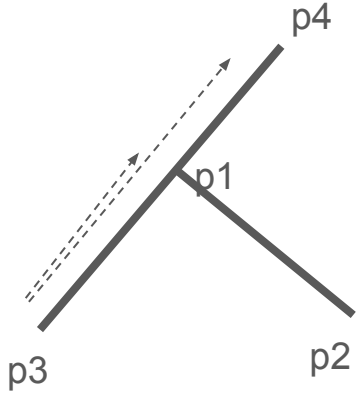
(counterclockwise)



$$\mathbf{d4} = (\mathbf{p4} - \mathbf{p1}) \times (\mathbf{p2} - \mathbf{p1}) < 0$$

(counterclockwise)

Intersecting but end/start point on segment

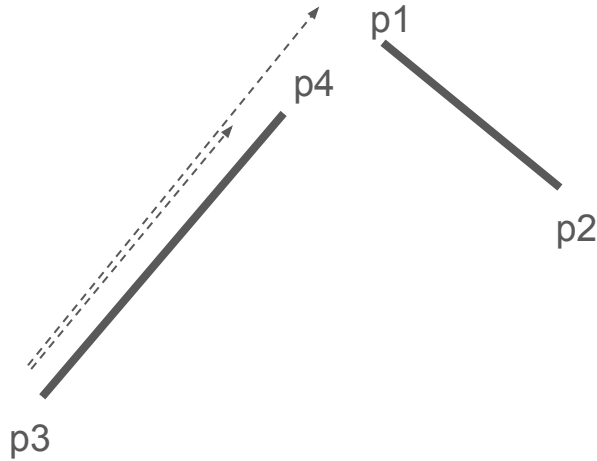


$$\mathbf{d1} = (\mathbf{p1} - \mathbf{p3}) \times (\mathbf{p4} - \mathbf{p3}) == 0 \quad \mathbf{d3} = (\mathbf{p3} - \mathbf{p1}) \times (\mathbf{p2} - \mathbf{p1}) == 0 \quad \mathbf{d2} = (\mathbf{p2} - \mathbf{p3}) \times (\mathbf{p4} - \mathbf{p3}) == 0$$

$$\mathbf{d4} = (\mathbf{p4} - \mathbf{p1}) \times (\mathbf{p2} - \mathbf{p1}) < 0$$

(counterclockwise)

Collinear but not intersecting



$$d1 = (p1 - p3) \times (p4 - p3) == 0$$

(no intersection) - needs
additional check to sure p1
lies between p3 and p4