Closest Pair of Points

I/P: n pts $P = \{p_1, \ldots, p_n\}$

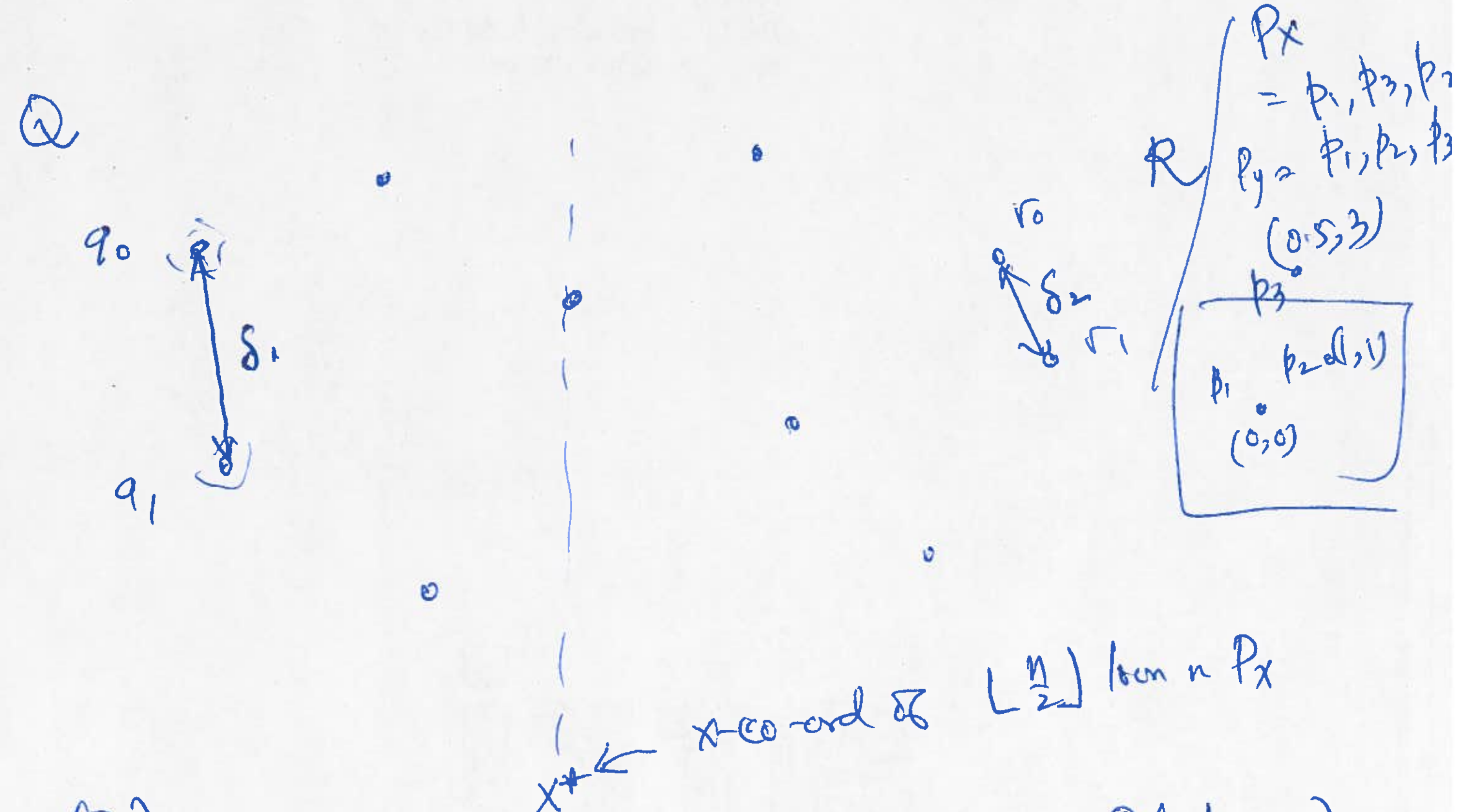
$p_i = (x_i, y_i) \in \mathbb{R}^2$

O/P: Pair (i,j) $i \neq j$ s.t. $d(p_i, p_j)$ is minimized

$$d(p_i, p_j) = \sqrt{(x_i - x_j)^2 + (y_i - y_j)^2}$$

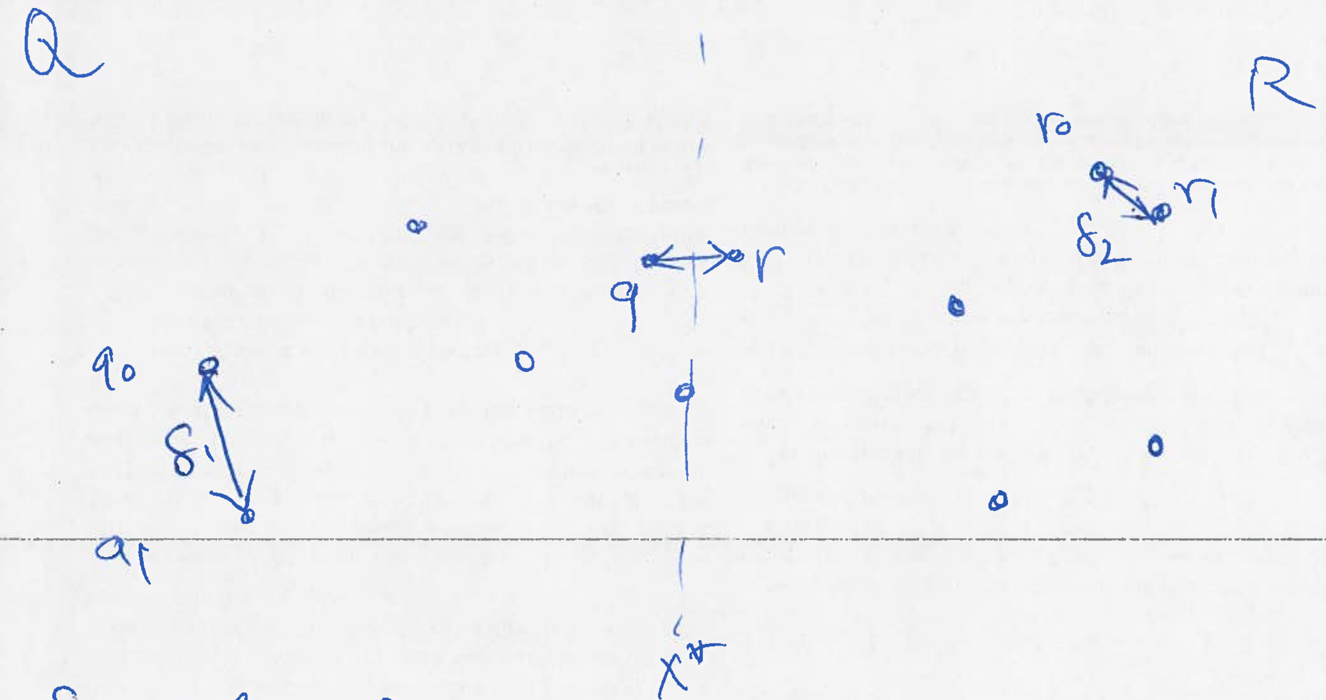
Assume: $x_1, \ldots, x_n$ / $y_1, \ldots, y_n$ are distinct

Let X^* be the ~~medi~~ median x-value.



P_x, (P_y) are pts in incr x (incr y) order $O(n \log n)$

Ques: Q_x, Q_y ; R_x, R_y from P_x & P_y in $O(n)$ time



$\delta = \min(\delta_1, \delta_2)$

Patch up problem: Compute ~~closest~~ closest "crossing" pair

Case 1: $\forall$ crossing pairs (q,r) ; $d(q,r) \geq \delta$

$\Rightarrow$ Trivial!

Case 2: $\exists$ (q,r) s.t $d(q,r) < \delta$