Algorithm	Description	Runtime(s)
Problem: Intersections ($\Omega(n^2)$ worst-case lower bound) In: n line segments; Out: k intersections		
Naive	Check every pair	$\Theta(n^2)$
Sweep-Line	Sweep left-to-right keeping track with PQ and BST	$O((n+k)\log n)$
Problem: Convex Hull ($\Omega(n \log n)$ lower bound) In: n vertices; Out: h edges of convex hull		
Naive	check each possible line segment	$O(n^3)$
Gift-Wrap	for each vertex, find next min w.r.t. angle	$O(n \cdot h) \subseteq O(n^2)$
D & C	sort; recurse on left/right halves; merge at bridges	$O(n \log n)$
G-Scan	ignore right turns; add left turns	$O(n \log n)$
Rand Inc	sort by x; randomly add vertices with buildTent	$O(n \log n)$
Chan's	uses Graham Scan as subroutines	$O(n \log h)$
K-S	"ultimate convex hull algorithm"; marriage-before-conquest	$O(n \log h)$
Problem: Geometric 2D Linear Programming In: $\mathbf{c}$, n half planes; Output: argmax $c^T x$		
2D LP	randomly add half planes; keep finding optimum	expected $O(n)$
Problem: Graph Traversal In: G (n nodes, m edges),source s/ dest d; Out: d, if d reachable from s		
DFS	find cycle, connected components, bipartition, topo sort, etc.	$O(n+m)$
BFS	uses queue to maintain order; large memory footprint	$O(n+m)$
Problem: MST In: weighted graph G (n nodes, m edges); Out: MST of G		
Prim's	like Dijkstra's; $O(m + n \log n)$ w/Fib heap; w/ bin heap	$O((m+n)\log n)$
Boruvka's	run Prim's simultaneously on all vertices	$O(m \log n)$
Kruskal's	sort edges; add edges greedily	$O(m \log n)$
Problem: Shortest Path In: weighted G (n nodes, m edges), source s/ dest d; Out: min path from s to d		
Dijkstra's	duh (w/ Fibo heap)	$O(m + n \log n)$
B-F	works with negative edge weights by relaxing *all* edges	$O(m \cdot n)$
F-W	find *all* shortest paths via DP (with negative edge weights)	$\Theta(n^3)$
Problem: Max Flow/Min Cut In: weighted G (n nodes, m edges), source s/ dest d; Out: min path from s to d		
F-F	push 1 down augmenting path; time depends on max cap c	$O(cE)$
P-P	Push and relabel	$\Theta(n^3)$
Problem: Parallel Matrix Multiplication In: matrices A and B; Out: $C = AB$		
P-Strassen	$O(n^{\log_2 7} \log n)$ work	$O(\log n)$ span

Primal: Max $\mathbf{c}^T\mathbf{x}$ w/ $A\mathbf{x} \le \mathbf{b}$, $\mathbf{x} \ge \mathbf{0}$. Dual: Min $\mathbf{b}^T\mathbf{y}$ w/ $A^T\mathbf{y} \ge \mathbf{c}$, $\mathbf{y} \ge \mathbf{0}$.

Duality Theorem: If primal and dual are feasible, then $\mathbf{c}^T\mathbf{x} \le \mathbf{b}^T\mathbf{y}$.