has an $\Omega(n \log n)$ lower bound as well. Hence, the algorithm presented in this chapter is asymptotically optimal.

1.10 Let $S$ be a set of $n$ (possibly intersecting) unit circles in the plane. We want to compute the convex hull of $S$.

a. Show that the boundary of the convex hull of $S$ consists of straight line segments and pieces of circles in $S$.
b. Show that each circle can occur at most once on the boundary of the convex hull.
c. Let $S'$ be the set of points that are the centers of the circles in $S$. Show that a circle in $S$ appears on the boundary of the convex hull if and only if the center of the circle lies on the convex hull of $S'$.
d. Give an $O(n \log n)$ algorithm for computing the convex hull of $S$.
e.* Give an $O(n \log n)$ algorithm for the case in which the circles in $S$ have different radii.