**Problem 10.** As shown in the figure below, triangle $ABC$ is inscribed in a circle. Line $\ell$ is tangent to the circle at $B$, and $D$ is the foot of the perpendicular from $C$ to $\ell$. Let $H$ be the foot of the altitude from $B$ to $AC$. Prove that line $DH$ is parallel to line $AB$.

![Diagram of the problem](image)

**Solution.** It suffices to show that $\angle BAH = \angle DHC$. First note that $\angle BAH = \angle DBC$ because the two angles subtend the same arc on the circle. Next consider the circle $\mathcal{C}$ with diameter $BC$. Because $\angle BDC$ and $\angle BHC$ are right angles, this circle passes through the points $B, H, C, D$. This $\angle DBC = \angle DHC$ because they subtend the same arc on circle $\mathcal{C}$. Thus it follows that $\angle BAH = \angle DHC$, so $AB$ is parallel to $DH$. 