5.11 Prove that there is no smallest positive irrational number.

5.19 Prove that $\sqrt{3}$ is irrational. [Hint: First prove for an integer $a$ that $3|a^2$ if and only if $3|a$. Recall that every integer can be written as $3q, 3q + 1, \text{or } 3q + 2$ for some integer $q$.]

5.31 Use a proof by contradiction to prove the following. Let $m \in \mathbb{Z}$. If $3 \nmid (m^2 - 1)$, then $3|m$.

(Bonus) Prove or disprove: The sine of 15 degrees is an irrational number.