1. Tautologies and Contradictions

2. Proof by Contradiction

Proposition: P is true.
Proof:

$\vdots$

□

Proposition: If P, then Q.
Proof:

$\vdots$

□

3. Is this a valid argument?

4. Prove that $\sqrt{2}$ is irrational.

5. Use proof by contradiction.

   (a) Prove if $a, b \in \mathbb{Z}$, then $a^2 - 4b - 3 \neq 0$.

   (b) Prove that for every $x \in [\frac{\pi}{2}, \pi]$, $\sin(x) - \cos(x) \geq 1$.

   You are allowed to use what you know about the values of $\sin(x)$ and $\cos(x)$ in this interval.