1. **"Or Conclusion"-style proof** is based on this equivalence: If either of two options is desired as a conclusion, then if one of them does NOT occur, the other MUST (the other conclusion has to "pick up the slack"). That is,
$$p \to (q \lor r) \equiv (p \land (\sim q)) \to r.$$
   (a) Create a standard order truth table to confirm this equivalence, and point out in a sentence what feature of the table actually shows that these statement forms are equivalent.
   (b) USE the equivalence to rewrite this statement about integers "If xy is even, then x is even or y is even" in equivalent form.
   (c) USE the equivalence to rewrite this statement about integers "If n^2 has a remainder of 1, then n has a remainder of 1 or 3 on division by 4."

2. Write a rigorous proof of each statement below. You must choose the appropriate proof style to suit each statement's form.
   (a) Let $p, q, r \in \mathbf{Z}$. If exactly one of these is even, then $p + q + r$ is also even.
   (b) Let $x \in \mathbf{Z}$. If 3 does not divide x (that is, $3 \nmid x$), then 3 divides $x^2 - 1$.
   (c) Let $x, y, z \in \mathbf{Z}$. If at least one of them is divisible by 7, then xyz is too.
   (d) Let $a, b, c \in \mathbf{Z}$. If $a \mid (2b + c)$, then $a \nmid b$ or $a \mid c$.
   (e) If $x, y \in \mathbf{Q}$, then $2x - y \in \mathbf{Q}$ also.
   (f) Let $x, y \in \mathbf{R}$ with $y \neq 0$. If $\frac{5+x}{y}$ is rational, then x is rational or y is irrational.

3. Prove by contrapositive:
   (a) Prop. - A circle has center $(2, 0)$. If $(5, 1)$ is not inside the circle, then $(-1, -1)$ is also not inside the circle.
   (b) Prop. - Let $a, b \in \mathbf{Z}$. If $7 \nmid ab$, then $7 \nmid a$ and $7 \nmid b$.
   (c) Prop. - Let $x \in \mathbf{R} \setminus \{0\}$. If $x + \frac{1}{x} \geq 2$, then x is positive.

4. Prove by "or conclusion"-style first, then prove by contrapositive: *Let $x, y \in \mathbf{Z}$. If $x + y$ is odd, then x is odd or y is odd.*