1. Show that if a right triangle has integer side lengths, then its area is not a perfect square.

2. Show that if there are positive integers $x, y, z$ such that $x^4 + y^4 = z^2$ and $\text{G.C.D.}(x, y) > 1$, then there must be other positive integers $a, b, c$ such that $a^4 + b^4 = c^2$ and $\text{G.C.D.}(a, b) = 1$.

3. Show that the Diophantine equation $x^4 + 4y^4 = z^2$ has no non-zero solutions.

4. Show that the Diophantine equation $x^4 + 3y^4 = z^2$ has infinitely many solutions.

5. Find the first few Germain primes.