1. Prove: If n = 25, 100, or 169, then n is a perfect square and is the sum of two perfect squares. Indicate which method of proof you used.
    a. Suppose $n^2 = 25$. n is equal to 5. $5^2 = 25$. Then, $3^2 + 4^2$ which the sum of two perfect squares $9 + 16 = 25$.
    b. Suppose $n^2 = 100$. n is equal to 10. $10^2 = 100$. Then, $6^2 + 8^2$ which the sum of two perfect squares $36 + 64 = 100$.
    c. Suppose $n^2 = 169$. n is equal to 13. $13^2 = 169$. Then, $5^2 + 12^2$ which the sum of two perfect squares $25 + 144 = 169$.

    For a-c, I've used the exhaustive proof in which I tried all possible combinations of n^2 sums from n = 1 to n =20. At the end, I realized that I could have used pathgorean therom.

2. Prove: The sum of two odd integers is even. Hint: By definition, even integers can be expressed as 2n, thus odd integers can be expressed as 2n + 1
    a. We let x and y be odd integers.
    By definition, even integers can be expressed as 2n, thus odd integers can be expressed as 2n + 1
    $\exists x(2n_x+1$ is odd) and $\exists y(2n_y+1$ is odd) So we claim: x+y is even.
    $x+y = 2n_x+1 + 2n_y+1 = 2(n_x+n_y) +2 = 2(n)+2$
    We simplify the two equations to 2n which by definition is even and plus 2 which is also even. Therefore x+y is even thus the sum of two odd integers are also even.

3. Prove: The sum of an even integer and it's square is even
    a. We let the sum of an even integer be n. So the squared of n is $(n)^2 = n^2$ which is also even. For a base case n =2, 1(2) = 2 and $(1*2)^2 = 4$ are both even. For a case n =4, 1(4) = 4 and $(1*4)^2 = 16$ are both even. For any other n case greater than 2 that is even, let k = n+2 is even then $(n+2)^2 = n^2 +4n +4$ is also even. Therefore, the sum of an even integer and it's square is even by induction and exhuastion proof.

4. Prove by Contradiction: If n squared is odd, then n is odd
    a. P is n squared is odd
    Q is n is odd

    So lets assume P is n squared is not odd with n = 2n+1 and Q is $n^2 = (2n+1)^2 = 4n^2+4n+1$ is odd. By definition, 2n is even (divisible by two) and 2n + 1 is odd by definition. So, (2n + 1) is odd by definition which contradicts with our earlier

statement of P. Even -> Odd   Contradiction.
So the statement of n squared is odd, then n is odd is true by contradiction.