1. The graph of the function $\dfrac{3^{x+y}}{2^{x+y}} = 8$ passes through only three of the four quadrants. Prove that the function is linear and identify, with proof, the quadrant through which the graph does not pass.

2. A

3. The coefficients a, b, and c of the equation $ax^2 + bx + c = 0$ are odd integers. Prove that there exists <u>no</u> ordered triple (a, b, c) for which the roots of the equation are rational.

4. A set of three or more distinct prime numbers is called *amazing* if the sum of every three of them is also a prime number. For example, the set $\{11, 23, 37, 79\}$ is an amazing set of primes since $11 + 23 + 37 = 71$ is prime, $11 + 23 + 79 = 113$ is prime, $11 + 37 + 79 = 127$ is prime, and $23 + 37 + 79 = 139$ is prime. However, the set $\{5, 7, 11, 13\}$ is not amazing since $5 + 7 + 13 = 25$.

   a)

4. a) Any integer n can be written in the form $n = 3k + r$ where k is an integer and $r = 0$, 1, or 2. Let us refer to these as type r, where $r = 0$, 1, or 2. The only prime number for which $r = 0$ is 3 itself. Suppose S is an amazing set of four primes, one of which is 3. Represent the three remaining primes as   ,   , and   .

   Claim: These three primes cannot all be of the same type r. Suppose they were. Then