1. The graph of the function $\dfrac{3^{x \quad y}}{2^{x \quad y}} \quad 8$ 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 $ax^2 \quad bx \quad c \quad 0$ 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)

P

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