- 1. The graph of the function $\frac{3^{x-y}}{2^{x-y}}$ 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 \underline{no} 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 s, and s.

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