1. For every equation E, if E is quadratic then E has at most two real solutions.  
a. All quadratic equations have at most two real solutions.  
b. Every quadratic equation has at most two real solutions.  
c. If an equation is quadratic, then it has at most two real solutions.  
d. If E is quadratic, then E has at most two real solutions.  
e. For every quadratic equation E, there are at most two real solutions.  
  
2. There is a real number whose product with every real number equals zero.  
a. Some real number has the property that its product with every real number equals zero.  
b. There is a real number a such that the product of a, with every real number equals zero.  
c. There is a real number a with the property that for every real number b, their product is zero.

3. Let R= {a}, S= {x, y} and T= {p, q, r). Find each of the following sets.  
  
a. R x (S x T)

= {a} x ({x, y} x {p, q, r})

= {a} x {(x, p), (x, q), (x, r), (y, p), (y, q), (y, r)}  
= {(a, (x, p)), (a, (x, q)), (a, (x, r)), (a, (y, p)), (a, (y, q)), (a, (y, r))}  
  
b. (R x S) x T

= ({a} x {x, y}) x {p, q, r}

= {(a, x), (a, y)} x {p, q, r}  
= {((a, x), p), ((a, x), q), ((a, x), r), ((a, y), p), ((a, y), q), ((a, y), r)}  
  
c. R x S x T

= {a} x {x, y} x {p, q, r}

= {(a, x, p), (a, x, q), (a, x, r), (a, y, p), (a, y, q), (a, y, r)}

4.

Answer:

All the strings of length 5 over T that have exactly one y are given below:

{x, x, x, x, y}, {y, x, x, x, x} {x, y, x, x, x}, {x, x, y, x, x}, {x, x, x, y, x}

5.

The Cartesian product of A and B is;  
A x B = {4,5,6} x {5,6,7}

= {(4, 5),(4,6),(4,7),(5,5),(5,6),(5,7),(6,5),(6,6),(6,7)}  
Now,

The relations:  
R= {(5,5), (6,5), (6,6)}  
S= {(4,6), (5,5), (5,7), (6,6)}  
T= {(4,7), (6,5), (6,7)}

R

5 5

6 6

Here, the relation R is not a function because two distinct ordered pairs have same first elements.

S

4 5

5 6

6 7

Here, the relation S is not a function because two distinct ordered pairs have same first elements.

T

4 5

6 7

Here, the relation T is not a function because two distinct ordered pairs have same first elements.

6.

(s, n) ∈ L means that the length of s is n.  
i.e., L(s) = n  
  
Then,

For L (0201):   
The length of string 0201 is 4.  
L (0201) =4, since (0201, 4) ∈ L

For L (12):   
The length of string 12 is 2.  
L (12) =2, since (12, 2) ∈ L

7.

Here,

H(x) = (x-2)2

= x2-4x+4

Similarly,

K(x) = (x-1) (x-3) +1

= (x2-4x+3) +1

= x2-4x+4

From the above equations, we can say, H(x) = K(x)

Plotting the graph:

|  |  |  |
| --- | --- | --- |
| x | H = x2-4x+4 | K = x2-4x+4 |
| 0 | 4 | 4 |
| 1 | 1 | 1 |
| 2 | 0 | 0 |
| 3 | 1 | 1 |
| 4 | 4 | 4 |
| 5 | 9 | 9 |
| 6 | 16 | 16 |
| 7 | 25 | 25 |