THE GURUKUL INSTITUTE

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ASSIGNMENT ON RELATION AND FUNCTIONS

1. If A = {1, 2, 3, 4, 5}, write the relation a R b such that a + b = 8, a ,b € A. Write the domain, range & co-domain.
2. Let R be the relation in the set N given by R = {(a,b)| a = b – 2 , b > 6} Whether the relation is reflexive or not ? Justify your answer.
3. Show that the relation R in the set N given by R = {(a , b)| a is divisible by b , a , b N} Is reflexive and transitive but not symmetric.
4. Let R be the relation in the set N given by R = {(a ,b)| a > b}
   Show that the relation Is neither reflexive nor symmetric but transitive.
5. Let R be the relation on R defined as (a , b) ϵ R iff 1+ ab > 0 a ,b ϵ R.
   (a) Show that R is symmetric.
   (b) Show that R is reflexive.
   (c) Show that R is not transitive.
6. Check whether the relation R is reflexive, symmetric and transitive.
   R = { (x ,y)| x – 3y=0} on A ={1,2,3……….13,14}.
7. Let f : R →R & g : R→R be defined as f(x) = x^2 , g(x) = 2x – 3 . Find fog(x).
8. If f: R→R defined as f(x) =$\frac{2x-7}{4}$ is an invertible function. Find f^{-1}(x).
9. Write the number of all one-one functions on the set A={a, b, c} to itself.
10. Let * be the binary operation on N given by a*b = LCM of a & b . Find 3*5.
11. Let *be the binary on N given by a*b =HCF of a ,b , a,b ϵ N. Find 20*16.
12. Let * be a binary operation on the set Q of rational numbers defined as a * b =$\frac{ab}{5}$.
    Write the identity of *, if any.
13. If a binary operation ‗*' on the set of integer Z , is defined by a * b = a + $3b^2$. Then find the value of 2 * 4.
14. Show that the function f: R→R defined by f(x)=x^2 is neither one-one nor onto.
15. Show that the function f: N→N given by f(x)=2x is one-one but not onto.
16. Show that the signum function f: R→R given by:
    $$F(x) = \begin{cases} 1, if\ x > o \\ 0, if\ x = 0 \\ -1, if\ x < 0 \end{cases}$$ is neither one-one nor onto.
17. Let A = {-1, 0,1} and B = {0,1}. State whether the function f : A → B defined by f(x) = x^2 is bijective.
18. Show that the relation R in the set A = {1, 2, 3, 4, 5} given by R = {(a, b) : |a – b| is even}, is an equivalence relation. Show that all the elements of {1, 3, 5} are related to each other and all the elements of {2, 4} are related to each other. But no element of {1, 3, 5} is related to any element of {2, 4 }.
19. Show that each of the relation R in the set A = {xϵ Z : 0 ≤ x ≤ 12}, given by R = {(a, b) : |a – b| is a multiple of 4} is an equivalence relation. Find the set of all elements related to 1.
20. Show that the relation R defined in the set A of all triangles as R = {(T1, T2) : T1 is similar to T2}, is equivalence relation. Consider three right angle triangles T1 with sides 3, 4, 5, T2 with sides 5, 12, 13 and T3 with sides 6, 8, 10. Which triangles among T1, T2 and T3 are related? If R1 and R2 are equivalence relations in a set A, show that R1∩ R2 is also an equivalence relation.

21. Let A = **R** – {3} and B = **R** – {1}. Consider the function f : A →B defined by $f(x) = \left(\frac{x-2}{x-3}\right)$. Is f one-one and onto? Justify your answer.
22. Consider f : **R+**→ [– 5, ∞) given by $f(x) = 9x^2 + 6x - 5$. Show that f is invertible and find f^{-1}.
23. On R – {1} a binary operation ‗*‘ is defined as a * b = a + b – ab. Prove that ‘*’ is commutative and associative. Find the identity element for ‘*’.Also prove that every element of R – {1} is invertible.
24. If A = Q x Q and ‘*’ be a binary operation defined by (a, b) * (c, d) = (ac, b + ad), for (a, b)∈(c, d) Then with respect to’*’ on A
    a. examine whether ‘*’ is commutative & associative:
    b. find the identity element in A,
    c. find the invertible elements of A
25. Show that the relation R on A ,A = { x| x ϵ Z , 0 ≤ x ≤ 12 } ,R = {(a ,b): |a - b| is multiple of 3.} is an equivalence relation.
26. Let N be the set of all natural numbers & R be the relation on N × N defined by { (a,b) R (c,d) iff a + d = b + c}. Show that R is an equivalence relation.
27. Show that the relation R in the set A of all polygons as: R ={(P_1,P_2), P_1 & P_2 have the same number of sides} is an equivalence relation. What is the set of all elements in A related to the right triangle T with sides 3,4 & 5 ?
28. Show that function f : R→R defined by $f(x)= 7-2x^3$ for all x ϵ R is bijective.
29. Let A= N×N & * be the binary operation on a A defined by (a,b) * (c,d) = (a+c, b+d)
    Show that * is (a) Commutative (b) Associative (c) Find identity for * on A, if any.