Q1. Let n be a fixed positive integer. Define a relation R on Z as follows (a, b) ∈ R ⇔ a-b is divisible by n. Show that R is an equivalence relation on Z.

Q2. Let z be the set of integers show that the relation R = {(a, b) ∈ Z : a + b is even} is an equivalence relation on Z.

Q3. Let S be a relation on the set R of real numbers defined by S = {(a, b) ∈ R x R : a^2 + b^2 = 1} prove that S is not an equivalence relation R.

Q4. Show that the relation R on the set R of real numbers defined as R = {(a, b) : a < b^2} is neither reflexive nor symmetric nor transitive.

Q5. Show that the relation R on R defined as R = {(a, b) : a < b} is reflexive and transitive but not symmetric.

Q6. Show that f : R → R, defined as f(x) = x^3, is a bijection.

Q7. Show that the modulus function f : R → R, given by f(x) = [x] is neither one-one nor onto.

Q8. Show that the function of F : R → R given by f(x) = x^3 + x is a bijection.

Q9. Let A = R – {2} and B = B- {1}. If f : A → B is a mapping defined by f(x) = \frac{x-1}{x-2}, show that f is bijective.

Q10. Show that f : R → R, given f(x) = x – [x], is neither one-one or onto.

Q11. Let A = R – {2} and B = B- {1}. If f : A → B is a mapping defined by f(x) = \frac{x-1}{x-2}, show that f is bijective.

Q12. If f(x) = e^x, prove that f (f(x) = x for all x ∈ R.

Q13. Find fog and gof, if (i) f(x) = e^x, g(x) = loge x (ii) f(x) = x + 1, g(x) = 2x + 3

Q14. Prove that the function f : R → R defined by f(x) = 2x-3 is invertible find f.

Q15. Let F : N → R be a function defined as f(x) = 4x^2 + 12x + 15. Show that f : N → Range (f) is invertible. Find the inverse of f.

Q16. Show that f : [-1, 1] → R, given by f(x) = \frac{x}{x+2} is one-one, find the inverse of the function f: (-1, 1) → Range (f).

Q17. Let ‘x’ be a binary operation on set 2 – {1} defined by a x b = a + b – ab ; a, b, ∈ Q – {1}. Find the identity element with respect to on Q. Also, prove that every element of Q – {1} is invertible.

Q18. Consider the binary operation ⊕ on the set 3 = {1, 2, 3, 4, 5} defined by A ⊕ B = Minimum of a and B. Write the composition table of a and b.