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1. R={(1,1),(2,2),(3,3),(1,2),(2,3)}

Reflexivity:

A={1,2,3}, we must have (1,1) , (2,2), and (3,3) in R.

(1,1)∈R(1,1)

(2,2)∈R(2,2)

(3,3)∈R(3,3)

Since all required pairs are present, R is reflexive.

Symmetry:

(1,2)∈R, but (2,1)∉R ⟶ Not symmetric

(2,3)∈R (3,2)∈/R ⟶ Not symmetric

Since symmetry fails for at least one pair, R is not symmetric.

Transitivity:

(1,2)∈R, (2,3)∈R(2,3 but (1,3)∉R ⟶ Not transitive

Since transitivity fails for at least one case, R is not transitive.

Hence, relation is reflexive but not symmetric and transitive.

EXPLAINATION:

Transitivity, Symmetry, and Reflexivity: We have a relation R with the pairs that are provided. The presence of (1,1), (2,2), and (3,3) for each element allows us to determine whether it is reflexive. Given the presence of all necessary pairings, the relationship is reflexive.

Then, if (a, b) is in R, then (b, a) should be in R as well for symmetry. However, while (1,2) is present in R, (2,1) is not. Likewise, (3,2) is absent but (2,3) is present. It is not symmetrical because at least one scenario fails.

For transitivity, (a, c) should be in R if (a, b) and (b, c) are in R. Although (1,2) and (2,3) are present, (1,3) is absent. The relationship is not transferable, thus.

2(a). f(x) = x2 and g(x) = 2x+1

f(g(x)) = ( g(x) )2

= (2x+1)2

= (2x)2 + 12+ 2(2x)(1

= 4x2+4x+1

Hence, 2+4x+1 Ans.

2(b). f(x) = x+1 and g(x) = x3+sinx

f(g(x))=(x3+sinx)+1

=x3+sinx+1

Hence, x3+sinx+1 Ans.

EXPLAINATION:

The process of creating a new function by combining two functions, f(x) and g(x), is known as function composition. To get the composition f(g(x)), substitute the expression for g(x) for the variable x in f(x).

To obtain f(g(x)) = (2x + 1), for example, we replace g(x) into f(x) if f(x) = x² and g(x) = 2x + 1.². We obtain 4x² + 4x + 1 by expanding this.

In a different example, if f(x) = x + 1 and g(x) = x³ + sin(x), then f(g(x)) = x³ + sin(x) + 1 if g(x) is substituted into f(x).

The process of mixing preexisting functions to create more intricate expressions that depict their interaction is known as function composition.

3(i).

let n =

taking limits:-

= Ans.

3(ii).

(x-1)

taking limits :-

= 1 Ans.

EXPLAINATION:

Limits provide insight into the behavior of functions as they get closer to a particular value. Finding the largest power of "n" in the numerator and denominator is how we solve the limit in the first example. We determine the limit to be 7/2 by simplifying the formula.

We factor the numerator in the second case to facilitate the evaluation of the limit. Both the numerator and the denominator can be eliminated because (x - 2) is present in both. When we take the limit after canceling, we discover that the answer is 1.

Limits simplify complicated expressions and enable us identify the values they approach by analyzing functions close to particular points.

4. .

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=

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= Ans.

EXPLAINATION:

Determining the derivative of a function y, which is represented as dy/dx, is basically figuring out how y varies with regard to x. Differentiation rules—in this example, the quotient rule—are applied to achieve this. Functions that have the form of one function divided by another can be distinguished using the quotient rule.

First, we simplify the expression at each level by gradually applying the quotient rule. Upon meticulously completing the computations, we determine the ultimate derivative to be -2/(sin(x) - cos(x))². This result gives us a valuable understanding of the behavior of the function at various locations by indicating the rate of change of the function y with respect to x.

5. f(x) = x³ - 3x² + 2

f'(x) = 3x² - 6x

= 3x(x - 2)

To find critical points we put f'(x) = 0 and solving:

3x(x - 2) = 0

x = 0 or x = 2

The critical points are x = 0 and x = 2.

For x < 0:

When x is negative, both x and (x - 2) are negative, so their product is positive.

Therefore, f'(x) > 0 when x < 0, and the function is increasing.

For 0 < x < 2:

In this interval, x is positive but (x - 2) is negative, so their product is negative.

Therefore, f'(x) < 0 when 0 < x < 2, and the function is decreasing.

For x > 2:

When x > 2, both x and (x - 2) are positive, so their product is positive.

Therefore, f'(x) > 0 when x > 2, and the function is increasing.

In conclusion:

The function f(x) = x³ - 3x² + 2 is increasing when x < 0 and x > 2.

The function is decreasing when 0 < x < 2.

EXPLAINTAION:

Finding a function's derivative, f'(x), is the first step in determining whether it is increasing or decreasing. We can identify crucial points, which split the function into intervals, by setting the derivative to zero.

The sign of f'(x) in each interval is then examined. The function is rising if f'(x) is positive, and decreasing if it is negative.

For instance, the function is rising if we discover that f'(x) is positive prior to x = 0. Since f'(x) is negative between x = 0 and x = 2, the function is decreasing. The function increases once again once x = 2, since f'(x) turns positive once more.

In conclusion, the function reduces between 0 and 2 and increases for x < 0 and x > 2.

6(i). I = ∫ logxdx

Integration by parts formula:

∫u dv=u v−∫v du

I = x logx −∫x⋅ dx

I = x logx − ∫ dx

I = x logx − x + C Ans.

6(ii). I =

let u=x4 => du = 4x3 dx

I =

I =

I = [sin-1u]01

I = sin-1(1) – sin-1 (0)

I = – 0]

I =

I = Ans.

EXPLAINATION:

We frequently employ several techniques, depending on the issue, to solve integrals. Integration by parts is a differentiation strategy derived from the product rule that we employ in the first example. Using the method step-by-step, we arrive at the following solution: x log(x) - x + C, where C is the integration constant.

We employ substitution for the second integral. This greatly simplifies the integral, therefore we let u = x⁴. We solve and discover that the answer is π/8 after applying and substituting the limits.

Integration by parts and substitution are both practical techniques that aid in the simplification of difficult integrals and facilitate the discovery of their solutions.