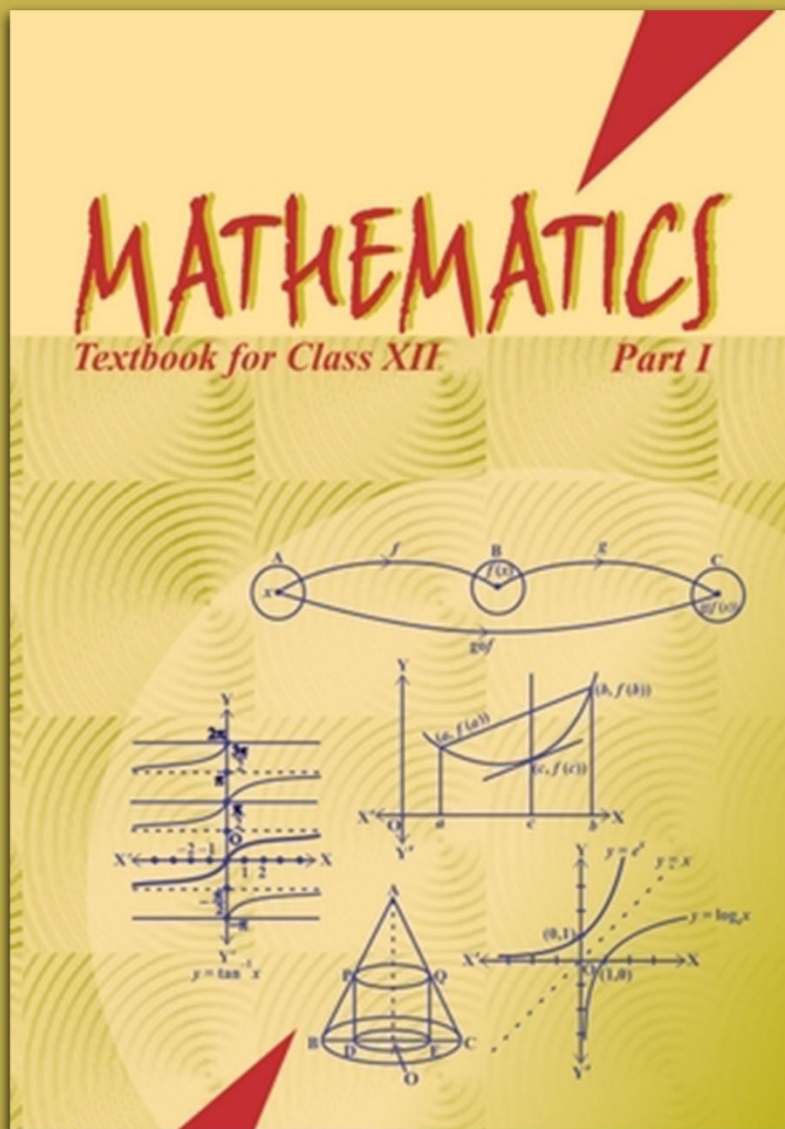


MATHS - I

Class XII

Solution



Stepwise Solution with Explanation



CLASS XII MATHEMATICS

NCERT Part I — Chapter-wise Solutions



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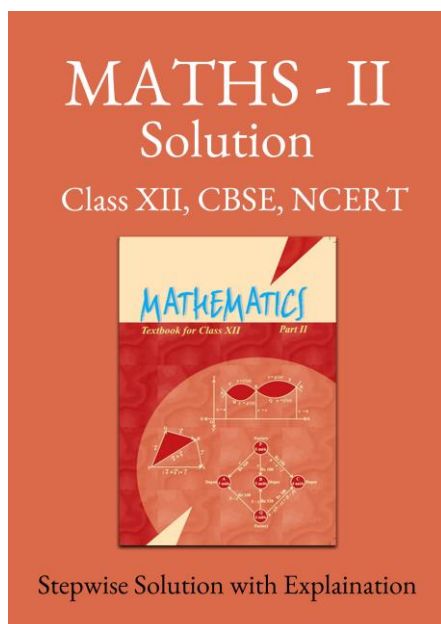
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Legend

Purple = Concepts	Amber = Tips	Red = Answers	Teal = Key Rules	Green = Info
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Solution to Part 2



CHAPTER 1: Relations and Functions

This solutions book helps Class XII students understand step-by-step reasoning behind every answer.

Each solution includes:

- Key Concept — the mathematical idea being applied
- Step-by-step working — detailed logic at every stage
- Final Answer — clearly marked result
- Tips — common mistakes to avoid

KEY DEFINITIONS AT A GLANCE

Term	Definition
Empty Relation	$R = \varnothing$ (no pairs at all)
Universal Relation	$R = A \times A$ (all pairs)
Reflexive	$(a, a) \in R$ for every $a \in A$
Symmetric	$(a, b) \in R \Rightarrow (b, a) \in R$ for all $a, b \in A$
Transitive	$(a, b) \in R$ and $(b, c) \in R \Rightarrow (a, c) \in R$
Equivalence	Reflexive + Symmetric + Transitive
One-one (Injective)	$f(x_1) = f(x_2) \Rightarrow x_1 = x_2$
Onto (Surjective)	Every element of co-domain Y has a pre-image in X
Bijjective	Both one-one AND onto
Invertible	f is invertible if and only if f is bijective

REMEMBER:

1. To disprove a property, find ONE counterexample.
2. Transitivity can hold 'vacuously' if no chain $(a, b), (b, c)$ exists in R .
3. An equivalence relation = Reflexive + Symmetric + Transitive (ALL three).
4. One-one + Onto = Bijective = Invertible.
5. For finite sets of the same size: one-one $\Leftrightarrow$ onto $\Leftrightarrow$ bijective.

EXERCISE 1.1 — Types of Relations

Question 1: Determine whether each relation is reflexive, symmetric, and transitive.

SOLUTION

Strategy: For each relation, either list the pairs OR reason directly.

To check Reflexive: Is $(a, a) \in R$ for every a in the set?

To check Symmetric: If $(a, b) \in R$, is $(b, a) \in R$?

To check Transitive: If $(a, b) \in R$ and $(b, c) \in R$, is $(a, c) \in R$?

Part (i): $R = \{(x, y) : 3x - y = 0\}$ in $A = \{1, 2, 3, \dots, 13, 14\}$

Step 1: Find the pairs. The condition $y = 3x$ gives:

$x=1 \rightarrow y=3$: (1,3) | $x=2 \rightarrow y=6$: (2,6) | $x=3 \rightarrow y=9$: (3,9) | $x=4 \rightarrow y=12$: (4,12)

$x=5 \rightarrow y=15$: NOT in A. So $R = \{(1,3), (2,6), (3,9), (4,12)\}$

Step 2 — Reflexive? Is $(a, a) \in R$ for all $a \in A$?

For (a,a) to be in R we need $3a - a = 0$, i.e., $2a = 0$, so $a = 0$. But $0 \notin A$.

Counterexample: $(1,1) \notin R$ because $3(1) - 1 = 2 \neq 0$.

R is NOT reflexive.

Step 3 — Symmetric? Does $(a,b) \in R \Rightarrow (b,a) \in R$?

$(1,3) \in R$. Is $(3,1) \in R$? Check: $3(3) - 1 = 8 \neq 0$. So $(3,1) \notin R$.

R is NOT symmetric.

Step 4 — Transitive? Does $(a,b) \in R$ and $(b,c) \in R \Rightarrow (a,c) \in R$?

$(1,3) \in R$ and $(3,9) \in R$. Is $(1,9) \in R$? Check: $3(1) - 9 = -6 \neq 0$. So $(1,9) \notin R$.

R is NOT transitive.

Part (i): R is NEITHER reflexive, NOR symmetric, NOR transitive.

Part (ii): $R = \{(x, y) : y = x + 5 \text{ and } x < 4\}$ in $\mathbb{N}$

Step 1: List pairs ($x \in \mathbb{N}$, $x < 4$, so $x = 1, 2, 3$):

(1,6), (2,7), (3,8)

Step 2 — Reflexive? (a,a) would need $a = a + 5$, i.e., $0 = 5$. Impossible.

NOT reflexive.

Step 3 — Symmetric? $(1,6) \in R$. Is $(6,1) \in R$? Need $1 = 6 + 5 = 11$. No.

NOT symmetric.

Step 4 — Transitive? The second elements are 6, 7, 8. None of these appear as first elements, so no chain $(a,b), (b,c)$ exists. Transitivity holds vacuously.

💡 Vacuous transitivity: When NO pair (a,b) and (b,c) both exist in R, there is nothing to violate transitivity. So it holds automatically.

Transitive (vacuously). ✓

Part (ii): Neither reflexive nor symmetric, but IS transitive.

Part (iii): $R = \{(x, y) : y \text{ is divisible by } x\}$ in $A = \{1, 2, 3, 4, 5, 6\}$

Step 1 — Reflexive? Is a divisible by a ? Yes, $a = 1 \times a$ always. So $(a, a) \in R$ for all a .

Reflexive. ✓

Step 2 — Symmetric? $(2, 4) \in R$ since 4 is divisible by 2. Is $(4, 2) \in R$? Is 2 divisible by 4? No.

NOT symmetric.

Step 3 — Transitive? If $b = k_1 a$ and $c = k_2 b$ (integers $k_1, k_2 \geq 1$), then $c = k_1 k_2 a$. So a divides c .

Transitive. ✓

Part (iii): Reflexive and Transitive, but NOT symmetric.

Part (iv): $R = \{(x, y) : x - y \text{ is an integer}\}$ in $\mathbb{Z}$

Reflexive: $x - x = 0 \in \mathbb{Z}$ always. ✓

Symmetric: If $x - y \in \mathbb{Z}$, then $y - x = -(x - y) \in \mathbb{Z}$. ✓

Transitive: $x - y \in \mathbb{Z}$ and $y - z \in \mathbb{Z} \Rightarrow x - z = (x - y) + (y - z) \in \mathbb{Z}$. ✓

Part (iv): R is an EQUIVALENCE RELATION (reflexive, symmetric, transitive).

Part (v): Relations on the set A of human beings in a town.

(a) same workplace

Reflexive: x works at same place as x . ✓

Symmetric: If x & y share workplace, so do y & x . ✓

Transitive: If x - y share workplace and y - z share workplace, then x - z share it too. ✓

EQUIVALENCE RELATION

(b) same locality

Same reasoning as (a) — living in same locality is reflexive, symmetric, transitive.

EQUIVALENCE RELATION

(c) x is exactly 7 cm taller than y

Reflexive: x cannot be 7 cm taller than x . ✗

Symmetric: If x is 7 cm taller than y , y is 7 cm shorter — NOT taller. ✗

Transitive: If x is 7 cm taller than y , and y is 7 cm taller than z , then x is 14 cm taller than z , NOT 7 cm. ✗

NONE of the three properties hold.

(d) x is wife of y

Reflexive: x cannot be wife of x . ✗

Symmetric: If x is wife of y , y is husband of x , not wife. ✗

Transitive: No valid chain $(x, y), (y, z)$ both in R can exist. Vacuously transitive.

NOT reflexive, NOT symmetric, transitive (vacuously).

(e) x is father of y

Reflexive: x cannot be father of x . ✗

Symmetric: If x is father of y , y is child of x , not father. ✗

Transitive: If x is father of y and y is father of z , x is grandfather of z (not father). ✗

NONE of the three properties hold.

Question 2: Show $R = \{(a,b) : a \leq b^2\}$ in $\mathbb{R}$ is neither reflexive, symmetric, nor transitive.

SOLUTION

Strategy: To DISPROVE a property, find ONE counterexample.

NOT Reflexive: Try $a = 1/2$. Is $1/2 \leq (1/2)^2 = 1/4$? No, since $1/2 > 1/4$.

So $(1/2, 1/2) \notin R$. R is NOT reflexive.

NOT Symmetric: $(1,2) \in R$ since $1 \leq 4$. Is $(2,1) \in R$? Is $2 \leq 1^2 = 1$? No.

So R is NOT symmetric.

NOT Transitive: Take $a = 2$, $b = -2$, $c = 1/2$.

$2 \leq (-2)^2 = 4$ ✓ and $-2 \leq (1/2)^2 = 1/4$ ✓

But: Is $2 \leq (1/2)^2 = 1/4$? No! So $(2, -2) \in R$ and $(-2, 1/2) \in R$ but $(2, 1/2) \notin R$.

Hence R is neither reflexive, nor symmetric, nor transitive. (Proved)

Question 3: Check if $R = \{(a, b) : b = a + 1\}$ in $\{1, 2, 3, 4, 5, 6\}$ is reflexive, symmetric, or transitive.

SOLUTION

Pairs in R : $(1,2), (2,3), (3,4), (4,5), (5,6)$

Reflexive? (a,a) would need $a = a+1$ i.e. $0 = 1$. Impossible. NOT reflexive.

Symmetric? $(1,2) \in R$. Is $(2,1) \in R$? Need $1 = 2+1 = 3$. No. NOT symmetric.

Transitive? $(1,2) \in R$ and $(2,3) \in R$. Is $(1,3) \in R$? Need $3 = 1+1 = 2$. No. NOT transitive.

R is neither reflexive, symmetric, nor transitive.

Question 4: Show $R = \{(a, b) : a \leq b\}$ in $\mathbb{R}$ is reflexive and transitive but NOT symmetric.

SOLUTION

Reflexive: $a \leq a$ is always true. So $(a,a) \in R \forall a \in \mathbb{R}$. ✓

Transitive: $a \leq b$ and $b \leq c \Rightarrow a \leq c$ (by transitivity of $\leq$). ✓

NOT Symmetric: $1 \leq 2$ so $(1,2) \in R$. But $2 \leq 1$ is FALSE, so $(2,1) \notin R$.

R is reflexive and transitive but NOT symmetric. (Proved)

Question 5: Check if $R = \{(a, b) : a \leq b^3\}$ in $\mathbb{R}$ is reflexive, symmetric, or transitive.

SOLUTION

Key insight: Cubing preserves sign but the inequality $a \leq b^3$ is not straightforward.

NOT Reflexive: Try $a = 1/2$. Is $1/2 \leq (1/2)^3 = 1/8$? No ($1/2 > 1/8$).

NOT Symmetric: $(1,2) \in R$ since $1 \leq 8$. Is $(2,1) \in R$? $2 \leq 1$? No.

NOT Transitive: $a=3, b=3/2, c=6/5$:

$3 \leq (3/2)^3 = 27/8 = 3.375$ ✓ and $3/2 \leq (6/5)^3 = 216/125 = 1.728$ ✓

But: Is $3 \leq (6/5)^3 = 1.728$? No! NOT transitive.

R is neither reflexive, symmetric, nor transitive.

Question 6: Show $R = \{(1,2), (2,1)\}$ in $\{1,2,3\}$ is symmetric but neither reflexive nor transitive.

SOLUTION

Reflexive? $(1,1)$ must be in R . It is NOT. NOT reflexive.

Symmetric? $(1,2) \in R$ and $(2,1) \in R$. Every pair has its reverse. Symmetric. ✓

Transitive? $(1,2) \in R$ and $(2,1) \in R \Rightarrow$ need $(1,1) \in R$. But $(1,1) \notin R$. NOT transitive.

R is symmetric but neither reflexive nor transitive. (Proved)

Question 7: Show $R = \{(x,y) : x \text{ and } y \text{ have the same number of pages}\}$ is an equivalence relation.

SOLUTION

Reflexive: Every book x has the same number of pages as itself. $(x,x) \in R$. ✓

Symmetric: If x has same pages as y , then y has same pages as x . ✓

Transitive: If x has same pages as y , and y same pages as z , then x and z have same pages. ✓

R is an equivalence relation. (Proved)

Question 8: Show $R = \{(a,b) : |a-b| \text{ is even}\}$ in $A = \{1,2,3,4,5\}$ is an equivalence relation.

SOLUTION

$|a-b|$ is even $\Leftrightarrow a$ and b have the same parity (both odd or both even).

Reflexive: $|a-a| = 0$, which is even. $(a,a) \in R \forall$ all a . ✓

Symmetric: $|a-b| = |b-a|$. If one is even, so is the other. ✓

Transitive: $a-b = 2m$ and $b-c = 2n \Rightarrow a-c = 2(m+n)$, which is even. ✓

Equivalence classes: $\{1,3,5\}$ (all odd) and $\{2,4\}$ (all even).

No odd number is related to any even number: $|1-2| = 1$ is odd. ✓

R is an equivalence relation. Equivalence classes: $\{1,3,5\}$ and $\{2,4\}$.

Question 9: Show each relation in $A = \{x \in \mathbb{Z} : 0 \leq x \leq 12\}$ is an equivalence relation.

SOLUTION

Part (i): $R = \{(a,b) : |a-b| \text{ is a multiple of } 4\}$

Reflexive: $|a-a| = 0 = 4 \times 0$. ✓

Symmetric: $|a-b| = |b-a|$. ✓

Transitive: If $4 \mid (a-b)$ and $4 \mid (b-c)$, then $4 \mid ((a-b)+(b-c)) = 4 \mid (a-c)$. ✓

Elements related to 1: $|a-1|$ must be multiple of 4, so $a = 1, 5, 9$.

Part (i): Equivalence relation. Set of elements related to 1 = $\{1, 5, 9\}$.

Part (ii): $R = \{(a,b) : a = b\}$

Reflexive: $a = a$. ✓ Symmetric: $a = b \Rightarrow b = a$. ✓ Transitive: $a = b$ and $b = c \Rightarrow a = c$. ✓

Only $a = 1$ is related to 1.

Part (ii): Equivalence relation. Set of elements related to 1 = $\{1\}$.

Question 10: Give examples of relations with specified properties.

SOLUTION

Use the set $A = \{1, 2, 3\}$ to construct targeted examples.

(i) Symmetric but neither reflexive nor transitive

Example: $A = \{1,2,3\}$, $R = \{(1,2),(2,1)\}$

NOT reflexive: $(1,1) \notin R$. Symmetric: $(1,2) \in R$ and $(2,1) \in R$. ✓ NOT transitive: $(1,2)$ and $(2,1)$ in R but $(1,1) \notin R$.

(i) Symmetric but neither reflexive nor transitive ✓

(ii) Transitive but neither reflexive nor symmetric

Example: $A = \{1,2,3\}$, $R = \{(1,2),(2,3),(1,3)\}$

NOT reflexive: $(1,1) \notin R$. NOT symmetric: $(1,2) \in R$ but $(2,1) \notin R$. Transitive: $(1,2)+(2,3) \Rightarrow (1,3) \in R$. ✓

(ii) Transitive but neither reflexive nor symmetric ✓

(iii) Reflexive and symmetric but not transitive

Example: $A = \{1,2,3\}$, $R = \{(1,1),(2,2),(3,3),(1,2),(2,1),(2,3),(3,2)\}$

Reflexive ✓ Symmetric ✓ NOT transitive: $(1,2)$ and $(2,3)$ in R but $(1,3) \notin R$.

(iii) Reflexive and symmetric but not transitive ✓

(iv) Reflexive and transitive but not symmetric

Example: $R = \{(a,b) : a \leq b\}$ in $\mathbb{R}$ (proved in Question 4)

Reflexive ✓ Transitive ✓ NOT symmetric: $1 \leq 2$ but $2 \leq 1$ is false.

(iv) Reflexive and transitive but not symmetric ✓

(v) Symmetric and transitive but not reflexive

Example: $A = \{1,2,3\}$, $R = \{(1,2),(2,1),(1,1),(2,2)\}$

NOT reflexive: $(3,3) \notin R$. Symmetric ✓ Transitive ✓ (verify all chains).

(v) Symmetric and transitive but not reflexive ✓

Question 12 (Key Part): Which triangles $T_1(3,4,5)$, $T_2(5,12,13)$, $T_3(6,8,10)$ are related under similarity?

SOLUTION

Two triangles are similar if and only if their corresponding sides are proportional.

Compare $T_1(3,4,5)$ and $T_3(6,8,10)$:
 $6/3 = 2$, $8/4 = 2$, $10/5 = 2$. All ratios are equal!

T_1 is similar to T_3 (ratio 1:2). T_2 is NOT similar to T_1 or T_3 .

Question 14: Find the set of all lines related to $y = 2x + 4$ under the parallel-lines relation.

SOLUTION

Two lines are parallel if and only if they have the same slope.
 The line $y = 2x + 4$ has slope 2. All parallel lines have the form $y = 2x + c$.

Set of all related lines = $\{y = 2x + c : c \in \mathbb{R}\}$

Question 15 (MCQ): $R = \{(1,2),(2,2),(1,1),(4,4),(1,3),(3,3),(3,2)\}$ in $\{1,2,3,4\}$

SOLUTION

Reflexive? Check: $(1,1),(2,2),(3,3),(4,4)$ all present in R . ✓ Reflexive.

Symmetric? $(1,2) \in R$. Is $(2,1) \in R$? Scanning R ... $(2,1)$ is NOT there. NOT symmetric.

Transitive? Check every chain:

$(1,2)$ and $(2,2) \Rightarrow$ need $(1,2) \in R$ ✓

$(1,3)$ and $(3,2) \Rightarrow$ need $(1,2) \in R$ ✓

$(1,3)$ and $(3,3) \Rightarrow$ need $(1,3) \in R$ ✓

$(3,3)$ and $(3,2) \Rightarrow$ need $(3,2) \in R$ ✓ All chains satisfied. Transitive. ✓

Answer: (B) R is reflexive and transitive but NOT symmetric.

Question 16 (MCQ): $R = \{(a,b) : a = b - 2, b > 6\}$ in $\mathbb{N}$

SOLUTION

Since $b > 6$, the pairs are: $(5,7),(6,8),(7,9),(8,10),\dots$

Check each option:

(A) $(2,4)$: $b=4$, not > 6 . ✗

(B) $(3,8)$: Is $3 = 8 - 2 = 6$? No. ✗

(C) $(6,8)$: Is $6 = 8 - 2 = 6$? Yes! And $b=8 > 6$. ✓

(D) $(8,7)$: Is $8 = 7 - 2 = 5$? No. ✗

Answer: (C) $(6,8) \in R$

EXERCISE 1.2 — Types of Functions

Injective (one-one): $f(x_1) = f(x_2) \Rightarrow x_1 = x_2$. Distinct inputs always give distinct outputs.
 Surjective (onto): For every y in co-domain Y , there exists x in domain X such that $f(x) = y$.
 Bijective: Both injective AND surjective.
 Test for NOT injective: Find $x_1 \neq x_2$ such that $f(x_1) = f(x_2)$.
 Test for NOT surjective: Find y in co-domain with no pre-image in domain.

Question 1: Show $f : \mathbb{R}^* \rightarrow \mathbb{R}^*$, $f(x) = 1/x$ is one-one and onto. What if domain = $\mathbb{N}$?

SOLUTION

One-one: Assume $f(x_1) = f(x_2) \Rightarrow 1/x_1 = 1/x_2 \Rightarrow x_1 = x_2$. ✓

Onto: For any $y \in \mathbb{R}^*$, set $x = 1/y$. Then $f(x) = 1/(1/y) = y$. Since $y \neq 0$, $x = 1/y \in \mathbb{R}^*$. ✓

When domain = $\mathbb{N}$: f is still one-one ($1/x_1 = 1/x_2 \Rightarrow x_1 = x_2$).

But f is NOT onto: $y = 2 \in \mathbb{R}^*$ requires $x = 1/2 \notin \mathbb{N}$.

f is bijective on $\mathbb{R}^*$. On $\mathbb{N}$: one-one but NOT onto.

Question 2: Check injectivity and surjectivity of the following functions.

SOLUTION

Quick checks:

NOT injective $\rightarrow f(a) = f(b)$ for some $a \neq b$ (e.g. $f(1) = f(-1)$ for even-power functions)

NOT surjective $\rightarrow$ some output value in co-domain is unreachable

(i) $f : \mathbb{N} \rightarrow \mathbb{N}$, $f(x) = x^2$

Injective? $x_1^2 = x_2^2$ in $\mathbb{N} \Rightarrow x_1 = x_2$ (both positive). ✓ Injective.

Surjective? Is $2 = x^2$ for some $x \in \mathbb{N}$? $x = \sqrt{2} \notin \mathbb{N}$. NOT surjective.

Injective but NOT surjective.

(ii) $f : \mathbb{Z} \rightarrow \mathbb{Z}$, $f(x) = x^2$

Injective? $f(1) = f(-1) = 1$, but $1 \neq -1$. NOT injective.

Surjective? $f(x) = x^2 \geq 0$, so $-1 \in \mathbb{Z}$ has no pre-image. NOT surjective.

Neither injective nor surjective.

(iii) $f : \mathbb{R} \rightarrow \mathbb{R}$, $f(x) = x^2$

Injective? $f(1) = f(-1) = 1$, but $1 \neq -1$. NOT injective.

Surjective? $x^2 \geq 0$ always, so -1 has no pre-image. NOT surjective.

Neither injective nor surjective.

(iv) $f : \mathbb{N} \rightarrow \mathbb{N}$, $f(x) = x^3$

Injective? $x_1^3 = x_2^3$ in $\mathbb{N} \Rightarrow x_1 = x_2$ (unique cube root for positives). ✓ Injective.

Surjective? Is $2 = x^3$ for some $x \in \mathbb{N}$? $x = \sqrt[3]{2} \notin \mathbb{N}$. NOT surjective.

Injective but NOT surjective.

(v) $f : \mathbb{Z} \rightarrow \mathbb{Z}, f(x) = x^3$

Injective? Cube function is strictly increasing $\Rightarrow$ one-one. ✓

Surjective? Is $2 = x^3$ for some $x \in \mathbb{Z}$? $\sqrt[3]{2} \notin \mathbb{Z}$. NOT surjective.

Injective but NOT surjective.

Question 7: State whether the function is one-one, onto, or bijective.

SOLUTION

(i) $f : \mathbb{R} \rightarrow \mathbb{R}, f(x) = 3 - 4x$

One-one? $f(x_1) = f(x_2) \Rightarrow 3 - 4x_1 = 3 - 4x_2 \Rightarrow x_1 = x_2$. ✓

Onto? For any $y \in \mathbb{R}$, $x = (3 - y)/4 \in \mathbb{R}$ gives $f(x) = y$. ✓

(i) Bijective (one-one and onto).

(ii) $f : \mathbb{R} \rightarrow \mathbb{R}, f(x) = 1 + x^2$

One-one? $f(1) = f(-1) = 2$, but $1 \neq -1$. NOT one-one.

Onto? $f(x) = 1 + x^2 \geq 1$ always. So $y = 0 \in \mathbb{R}$ has no pre-image. NOT onto.

(ii) Neither one-one nor onto.

Question 9: Is $f : \mathbb{N} \rightarrow \mathbb{N}$ defined by $f(n) = (n+1)/2$ if n is odd, $n/2$ if n is even, bijective?

SOLUTION

Strategy: compute the first few values and look for a pattern.

$f(1)=1, f(2)=1, f(3)=2, f(4)=2, f(5)=3, f(6)=3, \dots$

$f(1) = f(2) = 1$, but $1 \neq 2$. So f is NOT one-one $\Rightarrow$ NOT bijective.

💡 f IS onto (every $n \in \mathbb{N}$ is achieved: $n = f(2n-1)$ for example), but since not one-one, it is not bijective.

f is NOT bijective (fails one-one condition).

Question 10: Is $f : A \rightarrow B, A = \mathbb{R} - \{3\}, B = \mathbb{R} - \{1\}, f(x) = (x-2)/(x-3)$ one-one and onto?

SOLUTION

One-one: Assume $f(x_1) = f(x_2)$:

$$(x_1 - 2)/(x_1 - 3) = (x_2 - 2)/(x_2 - 3)$$

$$(x_1 - 2)(x_2 - 3) = (x_2 - 2)(x_1 - 3)$$

$$x_1x_2 - 3x_1 - 2x_2 + 6 = x_1x_2 - 3x_2 - 2x_1 + 6$$

$$-3x_1 - 2x_2 = -3x_2 - 2x_1$$

$-x_1 = -x_2 \Rightarrow x_1 = x_2$. One-one. ✓

Onto: For any $y \in B$ ($y \neq 1$), solve $(x-2)/(x-3) = y$:

$$x - 2 = y(x-3) \Rightarrow x - yx = -3y + 2 \Rightarrow x = (3y-2)/(y-1)$$

Is $x = 3$? Set $(3y-2)/(y-1) = 3 \Rightarrow 3y-2 = 3y-3 \Rightarrow -2 = -3$. Contradiction, so $x \neq 3$. ✓

And x is defined since $y \neq 1$. So f is onto. ✓

f is bijective (both one-one and onto).

Question 11 (MCQ): $f : \mathbb{R} \rightarrow \mathbb{R}, f(x) = x^4$

SOLUTION

$f(1) = f(-1) = 1$, so NOT one-one. $f(x) \geq 0$, so -1 has no pre-image. NOT onto.

Answer: (D) f is neither one-one nor onto.

Question 12 (MCQ): $f : \mathbb{R} \rightarrow \mathbb{R}, f(x) = 3x$

SOLUTION

One-one: $3x_1 = 3x_2 \Rightarrow x_1 = x_2$. ✓ Onto: For any y , $x = y/3 \in \mathbb{R}$ and $f(y/3) = y$. ✓

Answer: (A) f is one-one and onto (bijective).