V-JEE INSTITUTE

MATHEMATICS - XII

Relation and Functions, Inverse trigo., Matrix

Name :...................... Total Marks = 466

Time : 8 hr Date: 24/10/2017

Q1. Show that $f: N \rightarrow N$, given by $f(x) = \begin{cases} x+1, & \text{if } x \text{ is odd} \\ x-1, & \text{if } x \text{ is even} \end{cases}$, is both one-one and onto. **4**

Q2. Let A be the set of all 46 students of class XII in a school. Let $f : N \rightarrow N$ be a function defined $f(x)$ = Roll number of the student x. Show that 'f' is one-one but not onto. **4**

Q3. Show that the function $f: \{0\} \rightarrow R - \{0\}$ defined by $f(x) = \frac{1}{x}$ is one-one. is the result true, if the domain $R - \{0\}$ is replaced by N? **4**

Q4. Solve for x **4**

$$\tan^{-1}\left(\frac{2x}{1-x^2}\right) + \cot^{-1}\left(\frac{1-x^2}{2x}\right) = \frac{\pi}{3}, \ -1 < x < 1$$

Q5. Solve for x, **4**

$$\tan^{-1}\frac{x}{2} + \tan^{-1}\frac{x}{3} = \frac{\pi}{4}; \quad 0 < x < \sqrt{6}$$

Q6. Show that the function $f: R - \{3\} \rightarrow R - \{1\}$ given by $f(x) = \frac{x-2}{x-3}$ is an onto function. **4**

Q7. Let $f: N - \{1\} \rightarrow N$ be defined by $f(n)$ = the highest prime factor of n. Show that f is neither one-one nor onto. Find the range of f. **4**

Q8. Let $A = R - \{2\}$ and $B = R - \{1\}$ If $f: A \rightarrow B$ is a mapping defined by $f(x) = \frac{x-1}{x-2}$, show that f is bijective. **4**

Q9. If $f: R \rightarrow R$ be the function defined by $f(x) = 4x^3 + 7$, show that f is a bijection. **4**

Q10. If functions 'f' and 'g' are given by $f = \{(1, 2), (3, 5), (4, 1), (2, 6)\}$ and $g = \{(2, 6), (5, 4), (1, 3), (6, 1)\}$, find the range of '$f$' and '$g$' and write down the functions fog and gof. **4**

Q11. Let $A = \{1, 2, 3\}$, $B = \{4, 5\}$, $C = \{5, 6\}$. Let $f: A \rightarrow B$; $g: B \rightarrow C$ be defined by $f(1) = 4$, $f(2) = 5$, $f(3) = 4$, $g(4) = 5$, $g(5) = 6$. Find $gof: A \rightarrow C$. **4**

Q12. If $f: R \rightarrow R$ is defined by $f(x) = x^2 - 3x + 2$, find $f(f(x))$. **4**

Q13. Let $A = \{x \in R : 0 \le x \le 1\}$. If $f: A \rightarrow A$ is defined by **4**

$$f(x) = \begin{cases} x, & \text{if } x \in Q \\ 1-x, & \text{if } x \notin Q \end{cases}$$

Then prove that $fof(x) = x$ for all $x \in A$.

Q14. Let $f: R \rightarrow R$ be a function given by $f(x) = ax + b$ for all $x \in R$. Find the constants a and b such that $fof = I_R$. **4**

Q15. Consider $f: N \rightarrow N$, $g: N \rightarrow N$ and $h: N \rightarrow N$ defined as $f(x) = 2x$, $g(y) = 3y + 4$ and $h(z) = \sin z$ for all $x, y, z \in N$. Show that $ho(gof) = (hog)of$. **4**

Q16. Find the values of a and b. If **4**

$$A=\begin{bmatrix}1&2&2\\2&1&-2\\a&2&b\end{bmatrix}$$ is a matrix satisfying $AA^T=9I_3$,

Q17. If $\sin^{-1}\frac{2a}{1+a^2}+\sin^{-1}\frac{2b}{1+b^2}=2\tan^{-1}x$. Prove that $x=\frac{a+b}{1-ab}$. **4**

Q18. If $\cos^{-1}\frac{x}{2}+\cos^{-1}\frac{y}{3}=\alpha$ then prove that $9x^2-12xy\cos\alpha+4y^2=36\sin^2\alpha$ **4**

Q19. Find x, if **4**

$$\begin{bmatrix}x&-5&-1\end{bmatrix}\begin{bmatrix}1&0&2\\0&2&1\\2&0&3\end{bmatrix}\begin{bmatrix}x\\4\\1\end{bmatrix}=0.$$

Q20. Find A. If **4**

$$\begin{bmatrix}2&-1\\1&0\\-3&4\end{bmatrix}A=\begin{bmatrix}-1&-8&-10\\1&-2&-5\\9&22&15\end{bmatrix},$$

Q21. Consider $f:R\to R$ given by $f(x)=8x+5$. Show that f is invertible. Find the inverse of f. **4**

Q22. Show that $f:[-1,1]\to R$, given by $f(x)=\frac{x}{x+2}$ is one-one, Find the inverse of the function $f:[-1,1]\to Range(f)$. **4**

Q23. Let $Y=\{n^2:n\in N\}\subset N$. Consider $f:N\to Y$ given by $f(n)=n^2$. Show that f is invertible. Find the inverse of f. **4**

Q24. Let $A=R-\{3\}$ and $B=R-\{1\}$. Consider the function $f:A\to B$ defined by $f(x)=\frac{x-2}{x-3}$. Show that 'f' is one-one and onto and hence find f^{-1}. **4**

Q25. Let $f:N\to Y$ be a function defined as $f(x)=4x+3$, where $Y=\{y\in N: y=4x+3$ for some $x\in N\}$. Show that f is invertible. Find its inverse. **4**

Q26. Let * the binary operation on N given by $a*b=$ l.c.m. (a,b). Find: **4**
(i) 2 * 3 (ii) 5 * 15 (iii) Is * commutative? (iv) Find the identity of operation * in N. (v) which elements of N are invertible? Find them.

Q27. A binary operation * over $R-\{-1\}$ is defined as $a*b=\frac{a}{b+1}$. Is the operation * commutative, associative? **4**

Q28. Let * be a binary operation defined on Q. Find which of the binary operations are associative. **4**
(i) $a*b=a-b$ (ii) $a*b=\frac{ab}{4}$ (iii) $a*b=a-b+ab$ (iv) $a*b=ab^2$.

Q29. Consider the binary operations* : $R\times R\to R$ and $o:R\times R\to R$ defined as $a*b=|a-b|$ and $a\,o\,b=a$ for all, $a,b\in R$. Show that '*' is commutative but not associative, 'o' is associative but not commutative. **4**

Q30. Prove that **4**

$$2\tan^{-1}\left(\sqrt{\frac{a-b}{a+b}}\tan\frac{\theta}{2}\right)=\cos^{-1}\left(\frac{a\cos\theta+b}{a+b\cos\theta}\right)$$

Q31. If: $\tan^{-1}\left\{\dfrac{\sqrt{1+x^2}-\sqrt{1-x^2}}{\sqrt{1+x^2}+\sqrt{1-x^2}}\right\}=\alpha$, then prove that $x^2 = \sin 2\alpha$. **4**

Q32. If : $y = \cot^{-1}(\sqrt{\cos x}) - \tan^{-1}(\sqrt{\cos x})$, **4**

prove that $\sin y = \tan^2 \dfrac{x}{2}$

Q33. Show that A is a root of the polynomial $f(x)$. If **4**

$$A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}; \qquad f(x) = x^3 - 6x^2 + 7x + 2.$$

Q34. Show that the relation R, defined on the set A of all polygons as **4**

$R = \{(P_1, P_2) : P_1$ and P_2 have same number of sides$\}$,

is an equivalence relation. What is the set of all elements in A related to the right angle triangle T with sides 3, 4 and 5?

Q35. Given a non-empty set X, consider $P(X)$ which is the set of all subsets of X. Define a relation in $P(X)$ as follows: **4**

For subsets A, B in $P(X)$, ARB if $A \subset B$. Is R an equivalence relation on $P(X)$? Justify your answer.

Q36. Show that the relation R defined on the set A of all triangles in a plane as **4**

$R = \{(T_1, T_2) : T_1$ is similar to $T_2\}$ is an equivalence relation.

Consider three right angle triangles T_1 with sides 3, 4, 5; T_2 with sides 5, 12, 13 and T_3 with sides 6, 8, 10. Which triangles among T_1, T_2 and T_3 are related?

Q37. Let $A = \{1, 2, 3, ..., 9\}$ and R be the relation in $A \times A$ defined by $(a, b) R (c, d)$ if $a + d = b + c$, for $(a, b), (c, d) \in A \times A$. Prove that R is an equivalence relation, also obtain the equivalence class $[(2, 5)]$. **4**

Q38. In the set of natural numbers N, define a relation R as follows: **4**

For every $m, n \in N$, nRm if on division by 5 each of the integers n and m leave the remainder less than 5, *i.e.*, one of the numbers 0, 1, 2, 3, 4. Show that R is an equivalence relation. Also obtain the pairwise disjoint subsets determined by R.

Q39. Check the relation R for reflexivity, symmetry and transitivity, given as aRb, if b is divisible by a, $\forall$ $a, b \in N$. **4**

Q40. Let $f: A \to B$ be a given function. A relation R in set A is given by $R = \{(a, b) \in A \times A \mid f(a) = f(b)\}$. Check, if R is an equivalence relation. **4**

Q41. Let P be the set of all the points in a plane and the relation R in set P be defined as $R = \{(A, B) \in P \times P \mid$ distance between points A and B is less than 3 units$\}$. Show that the relation R is not an equivalence relation. **4**

Q42. Prove that the relation R in the set $A = \{1, 2, 3, 4, 5\}$ given $R = \{(a, b) : |a - b|$ is even$\}$, is an equivalence relation. **4**

Show that all the elements of $\{1, 2, 3\}$ 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 $\{2, 4\}$.

Q43. Show that the relation R defined by $(a, b) R (c, d) \Rightarrow a + d = b + c$ on the set $N \times N$ is an equivalence relation. **4**

Q44. Prove that 4

If $A = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$, then $A^n = \begin{bmatrix} 1+2n & -4n \\ n & 1-2n \end{bmatrix}$, where n is any positive integer.

Q45. Solve for x : 4

$$\tan(\cos^{-1} x) = \sin\left(\cot^{-1}\frac{1}{2}\right)$$

Q46. Solve for x : 4

$$3\sin^{-1}\frac{2x}{1+x^2} - 4\cos^{-1}\frac{1-x^2}{1+x^2} + 2\tan^{-1}\frac{2x}{1-x^2} = \frac{\pi}{3}$$

Q47. Solve for x : 4

$$\sin^{-1} x + \sin^{-1} 2x = \frac{\pi}{3}$$

Q48. Solve for x : 4

$$\sin^{-1}(1-x) - 2\sin^{-1} x = \frac{\pi}{2}$$

Q49. Solve for x : 4

$$\tan^{-1}\frac{x-1}{x-2} + \tan^{-1}\frac{x+1}{x+2} = \frac{\pi}{4}$$

Q50. If $\sin\left(\sin^{-1}\frac{1}{5} + \cos^{-1} x\right) = 1$, then find the value of x. 4

Q51. Solve for x, 4

$$\cos(2\sin^{-1} x) = \frac{1}{9}, x > 0$$

Q52. Show that 4

$$\tan\left(\frac{1}{2}\sin^{-1}\frac{3}{4}\right) = \frac{4-\sqrt{7}}{3}.$$

Q53. Solve following equation for x, 4

$$\tan^{-1}\left(\frac{1-x}{1+x}\right) = \frac{1}{2}\tan^{-1} x; x > 0.$$

Q54. Prove that 4

$$\tan^{-1}\left(\frac{1}{2}\right) + \tan^{-1}\left(\frac{1}{5}\right) + \tan^{-1}\left(\frac{1}{8}\right) = \frac{\pi}{4}.$$

Q55. Solve for x, 4

$$\tan^{-1}\left(\frac{1+x}{1-x}\right) = \frac{\pi}{4} + \tan^{-1} x, 0 < x < 1$$

Q56. Prove that : 4

$$\frac{\alpha^3}{2}\operatorname{cosec}^2\left(\frac{1}{2}\tan^{-1}\frac{\alpha}{\beta}\right) + \frac{\beta^3}{2}\sec^2\left(\frac{1}{2}\tan^{-1}\frac{\beta}{\alpha}\right) = (\alpha+\beta)(\alpha^2+\beta^2).$$

Q57. Prove that : **4**

$$\tan^{-1}\left[\frac{3\sin 2\theta}{5+3\cos 2\theta}\right]+\tan^{-1}\left(\frac{1}{4}\tan\theta\right)=\theta.$$

Q58. Prove that **4**

$$\tan^{-1}\frac{2ab}{a^2-b^2}+\tan^{-1}\frac{2xy}{x^2-y^2}=\tan^{-1}\frac{2\alpha\beta}{\alpha^2-\beta^2}$$

where $\alpha = ax - by$ and $\beta = ay + bx$

Q59. Using elementary transformation, find inverse of matrix: **4**

$$A=\begin{bmatrix}2 & 5\\ 1 & 3\end{bmatrix}.$$

Q60. Prove that **4**

$$\sin^{-1}\left(\frac{4}{5}\right)+\sin^{-1}\left(\frac{5}{13}\right)+\sin^{-1}\left(\frac{16}{65}\right)=\frac{\pi}{2}.$$

Q61. Prove that : **4**

$$2\tan^{-1}\frac{1}{5}+\sec^{-1}\frac{5\sqrt{2}}{7}+2\tan^{-1}\frac{1}{8}=\frac{\pi}{4}.$$

Q62. If $\sin^{-1}x+\sin^{-1}y+\sin^{-1}z=\pi$ **4**

Prove that $x^4+y^4+z^4+4x^2y^2z^2=2(x^2y^2+y^2z^2+z^2x^2)$

Q63. If $x=\operatorname{cosec}\left\{\tan^{-1}\left\{\cos\left(\cot^{-1}\left(\sec\left(\sin^{-1}a\right)\right)\right)\right\}\right\}$ Prove that $x^2 = 3 - a^2$ **4**

Q64. Prove that : **4**

$$\cos[\tan^{-1}\{\sin(\cot^{-1}x)\}]=\sqrt{\frac{x^2+1}{x^2+2}}$$

Q65. Prove that : **4**

$$\tan^{-1}\frac{63}{16}=\sin^{-1}\frac{5}{13}+\cos^{-1}\frac{3}{5}.$$

Q66. Using elementary transformations, find the inverse of the matrix: **4**

$$\begin{bmatrix}1 & -1\\ 2 & 3\end{bmatrix}.$$

Q67. Prove that : **4**

$$\tan^{-1}\left\{\frac{\sqrt{1+\cos x}+\sqrt{1-\cos x}}{\sqrt{1+\cos x}-\sqrt{1-\cos x}}\right\}=\frac{\pi}{4}-\frac{x}{2}, \text{ if } \pi<x<\frac{3\pi}{2}$$

Q68. Prove that **4**

$$\tan^{-1}\sqrt{x}=\frac{1}{2}\cos^{-1}\left(\frac{1-x}{1+x}\right), x\in(0,1)$$

Q69. Prove that **4**

$$\cos^{-1}\left(\frac{\cos\alpha+\cos\beta}{1+\cos\alpha\cos\beta}\right)=2\tan^{-1}\left(\tan\frac{\alpha}{2}\tan\frac{\beta}{2}\right).$$

Q70. Prove that **4**

$$\tan^{-1}\left(\frac{x}{y}\right)-\tan^{-1}\left(\frac{x-y}{x+y}\right)=\frac{\pi}{4}$$

Q71. Prove that **4**

$$\cot^{-1}\left[\frac{\sqrt{1+\sin x}+\sqrt{1-\sin x}}{\sqrt{1+\sin x}-\sqrt{1-\sin x}}\right]=\frac{x}{2};$$

Q72. Using elementary transformations, find the inverse of the matrix: **4**

$$\begin{bmatrix} 2 & -3 \\ -1 & 2 \end{bmatrix}.$$

Q73. If A, B, C are three matrices such that $A = [x \quad y \quad z]$ **4**

$$B = \begin{bmatrix} a & h & g \\ h & b & f \\ g & f & c \end{bmatrix}, \quad C = \begin{bmatrix} x \\ y \\ z \end{bmatrix}, \quad \text{find } A(BC).$$

Q74. Show that $F(x)\, F(y) = F(x + y)$. If **4**

$$F(x) = \begin{bmatrix} \cos x & -\sin x & 0 \\ \sin x & \cos x & 0 \\ 0 & 0 & 1 \end{bmatrix}.$$

Q75. Using elementary transformations, find the inverse of the matrix: **4**

$$\begin{bmatrix} 2 & 1 \\ 4 & 2 \end{bmatrix}.$$

Q76. Prove that the product of matrices **4**

$\begin{bmatrix} \cos^2\theta & \cos\theta\sin\theta \\ \cos\theta\sin\theta & \sin^2\theta \end{bmatrix}$ and $\begin{bmatrix} \cos^2\phi & \cos\phi\sin\phi \\ \cos\phi\sin\phi & \sin^2\phi \end{bmatrix}$ is the null matrix, when θ and ϕ differ by an odd multiple of $\frac{\pi}{2}$.

Q77. Show that $(aI + bA)^n = a^nI + na^{n-1}bA$, where I is the identity matrix of order 2 and $n \in N$. **4**

If $A = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}$.

Q78. Prove that a matrix which is both symmetric as well as skew-symmetric is a null matrix. **4**

Q79. Show that the matrix $B'AB$ symmetric or skew symmetric according as A is symmetric or skew symmetric. **4**

Q80. Let $X = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$. Let R_1 be a relation on X given by $R_1 = \{(x, y) : x - y$ is divisible by 3\} and R_2 another relation on X given by $R_2 = \{(x, y) : \{x, y\} \subset \{1, 4, 7\}$ or $\{x, y\} \subset 2, 5, 8\}$ or $(x, y) \subset \{3, 6, 9\}$. Show that $R_1 = R_2$. **6**

Q81. Express the following matrix as the sum of a symmetric and a skew symmetric matrix; **6**

$$\begin{bmatrix} 3 & 3 & -1 \\ -2 & -2 & 1 \\ -4 & -5 & 2 \end{bmatrix}.$$

Q82. Express A as sum of two matrices such that one is symmetric and the other is skew symmetric. If **6**

$$A = \begin{bmatrix} 3 & 2 & 5 \\ 4 & 1 & 3 \\ 0 & 6 & 7 \end{bmatrix}.$$

Q83. Let $f(x) = \frac{x}{\sqrt{1+x^2}}$. Then, show that $(fofof)(x) = \frac{x}{\sqrt{1+3x^2}}$. **6**

Q84. Let R be the relation defined on the set $A = \{1, 2, 3, 4, 5, 6, 7\}$ by $R = \{(a, b)$: both a and b are either odd or even$\}$. Show that R is an equivalence relation. Further, show that all the elements of the subset $\{1, 3, 5, 7\}$ are related to each other and all the elements of the subset $\{2, 4, 6\}$ are related to each other, but no element of the subset $\{1, 3, 5, 7\}$ is related to any element of the subset $\{2, 4, 6\}$. **6**

Q85. Using elementary transformations, find the inverse of the matrix **6**

$$\begin{bmatrix} -1 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$$

Q86. Using elementary transformations, find the inverse of the matrix **6**

$$\begin{bmatrix} 3 & 0 & -1 \\ 2 & 3 & 0 \\ 0 & 4 & 1 \end{bmatrix}$$

Q87. Solve for x : **6**

$\sin[2\cos^{-1}\{\cot(2\tan^{-1}x)\}] = 0$

Q88. Let $f : N \to R$ be a function defined as $f(x) = 4x^2 + 12x + 15$. Show that $f : N \to Range(f)$ is invertible. Find the inverse of f. **6**

Q89. Using elementary transformations, find the inverse of the matrix **6**

$$\begin{bmatrix} 2 & 0 & -1 \\ 5 & 1 & 0 \\ 0 & 1 & 3 \end{bmatrix}$$

Q90. Show that the function $f : N \to N$ given by $f(n) = n - (-1)^n$ for all $n \in N$ is a bijection. **6**

Q91. If $f : R - \left\{\frac{7}{5}\right\} \to R - \left\{\frac{3}{5}\right\}$ be defined as $f(x) = \frac{3x+4}{5x-7}$ and $g : R - \left\{\frac{3}{5}\right\} \to R - \left\{\frac{7}{5}\right\}$ be defined as $g(x) = \frac{7x+4}{5x-3}$. Show that $gof = I_A$ and $fog = I_B$, where $B = R - \left\{\frac{3}{5}\right\}$ and $A = R - \left\{\frac{7}{5}\right\}$. **6**

Q92. A trust fund has Rs. 30000 that must be invested in two different types of bonds. The first bond pays 5% interest per year, and the second bond pays 7% interest per year. Using matrix multiplication, determine how to divide Rs. 30000 among the two types of bonds. If the trust fund must obtain an annual total interest of **6**

(i) Rs. 1800 (ii) Rs. 2000

Q93. If A and B are square matrices of the same order such that $AB = BA$, then prove by induction that $AB^n = B^nA$. Further, prove that $(AB)^n = A^nB^n$ for all $n \in$ N. **6**

Q94. Prove that **6**

$$A^n = \begin{bmatrix} 3^{n-1} & 3^{n-1} & 3^{n-1} \\ 3^{n-1} & 3^{n-1} & 3^{n-1} \\ 3^{n-1} & 3^{n-1} & 3^{n-1} \end{bmatrix}, n \in N. \text{ If } A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}.$$

Q95. If a is a non-zero real or complex number. Use the principle of mathematical induction to prove that **6**

If $A = \begin{bmatrix} a & 1 \\ 0 & a \end{bmatrix}$, then $A^n = \begin{bmatrix} a^n & na^{n-1} \\ 0 & a^n \end{bmatrix}$ for every positive integer n.

Q96. Prove that, if **6**

$$A_\alpha = \begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$$

(i) $A_\alpha \cdot A_\beta = A_{\alpha+\beta}$ (ii) $(A_\alpha)^n = \begin{bmatrix} \cos n\alpha & \sin n\alpha \\ -\sin n\alpha & \cos n\alpha \end{bmatrix}$ for every positive integer n.

Q97. Verify that $A^3 - A^2 - 3A - I = 0$. If **6**

$$A = \begin{bmatrix} 1 & 0 & -2 \\ -2 & -1 & 2 \\ 3 & 4 & 1 \end{bmatrix}.$$

Q98. Prove that $A^2 - 5A + 7I = 0$ use this to find A^4. If **6**

$$A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$$

Q99. Let **6**

$A = \begin{bmatrix} 0 & -\tan(\alpha/2) \\ \tan(\alpha/2) & 0 \end{bmatrix}$ and I be the identity matrix of order 2. show that

$$I + A = (I - A)\begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$$

Q100 Show that the relation S in the set $A = \{x \in Z : 0 \le x \le 12\}$ given by $S = \{(a, b) : a, b \in Z, |a - b| \text{ is divisible by } 4\}$ is an equivalence relation. Find the set of all elements related to 1. **6**

Q101 Show that the relation R on the set A of points in a plane, given by **6**

$R = \{(P, Q) :$ Distance of the point P from the origin is same as the distance of the point Q from the origin$\}$,

is an equivalence relation.

Further show that the set of all points related to a point $P \neq (0, 0)$ is the circle passing through P with origin as centre.

Q102 If $f, g : R \to R$ are defined respectively by $f(x) = x^2 + 3x + 1$, $g(x) = 2x - 3$, find (i) fog (ii) gof (iii) fof (iv) gog. **6**

Q103 Let, $f : Z \to Z$ be defined by $f(n) = 3n$ for all $n \in Z$ and $g : Z \to Z$. be defined by **6**

$$g(n) = \begin{cases} \dfrac{n}{3}, & \text{if } n \text{ is a multiple of 3} \\ 0, & \text{if } n \text{ is not a multiple of 3} \end{cases} \quad \text{for all } n \in Z.$$

Show that $gof = I_Z$ and $fog \neq I_Z$.

Q104 **Show that the function** $f: R \to \{x \in R : -1 < x < 1\}$ **defined by** $f(x) = \frac{x}{1+|x|}$, $x \in R$ **is one-one function.** **6**