



MATHS

BOOKS - RD SHARMA MATHS (ENGLISH)

FUNCTION

Others

1. Find gofandfog wehn $f: R\overrightarrow{R}$ and $g: R\overrightarrow{R}$ are defined by f(x) = 2x + 3 and $g(x) = x^2 + 5$ $f(x) = 2x + x^2$ and $g(x) = x^3$ $f(x) = x^2 + 8$ and $g(x) = 3x^3 + 1$ $f(x) = 8x^3$ and $g(x) = x^{1/3}$

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2. Let $f = \{(1, -1), (4, -2), (9, -3), (16, 4)\}$ and $g = \{(-1, -2), (02, -4), (-3, -6), (4, 8)\}$. Show that *gof* is

defined while fog is not defined. Also, find gof.



3. Show that if f_1andf_2 are one-one maps from $R \to R$, then the product $f_1 \times f_2 : R \to R$ defined by $(f_1 \times f_2)(x) = f_1(x)f_2(x)$ need not be one-one.

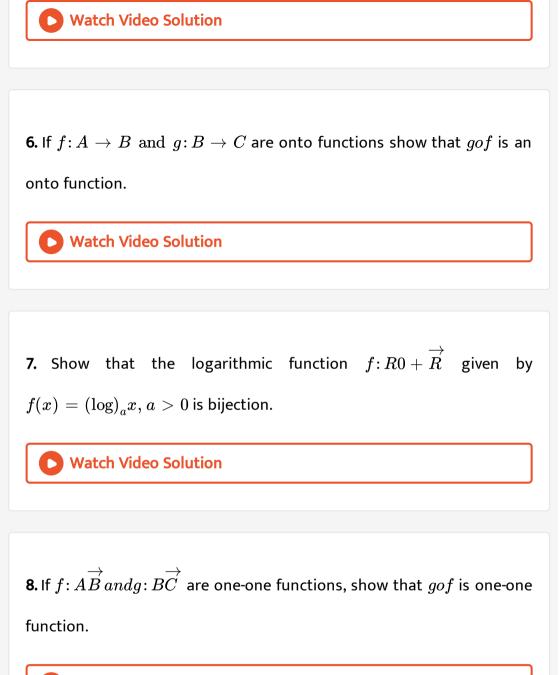
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4. Give examples of two surjective function f_1 and f_2 from Z to Z such

that $f_1 + f_2$ is not surjective.



5. Given examples of two one-one functions f_1andf_2 from R to R such that $f_1 + f_2: R\overrightarrow{R}$, defined by $(f_1 + f_2)(x) = f_1(x) + f_2(x)$ is not one-one.



9. If $f\!:\!R o R$ be the function defined by $f(x)=4x^3+7,\,$ show that

f is a bijection.



10. Let $A = \{1, 2, 3\}$. Write all one-one from A to itself.

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11. Show that $f : \stackrel{\longrightarrow}{RR}$, given by f(x) = x - [x], is neither one-one nor

onto.



12. Suppose $f_1 and f_2$ are non-zero one-one functions from $R \to R$ is $\frac{f_1}{f_2}$ necessarily one-one? Justify your answer. Here, $\frac{f_1}{f_2} : R \to R$ is given by $\left(\frac{f_1}{f_2}\right)(x) = \frac{f_1(x)}{f_2(x)}$ for all $x \in R$.

13. Let
$$f = \{(3, 1), (9, 3), (12, 4)\}$$
 and g

 $= \{(1, 3), (3, 3), (4, 9), (5, 9)\}$. Show that gof and fog are both defined. Also, find fog and gof.

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14. Find fog(2) and gof(1) when: $f\!:\!R o R; f(x)=x^2+8$ and $g\!:\!R o R; g(x)=3x^3+1.$

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15. Let $f: R\overrightarrow{R}$ and $g: R\overrightarrow{R}$ be defined by $f(x) = x^2$ and g(x) = x + 1. Show that $fog \neq gof$.

16. Let R^+ be the set of all non-negative real numbers. if $f: R^+ \to R^+$ and $g: R^+ \to R^+$ are defined as $f(x) = x^2$ and $g(x) = +\sqrt{x}$. Find fog and gof. Are they equal functions.



17. Let L be the line of intersection of the planes 2x + 3y + z = 1 and x + 3y + 2z = 2 . If L makes an angles α with the positive x-axis, then $\cos \alpha$ equals

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18. Let $f \colon R o R$ and $g \colon R o R$ be defined by f(x) = x + 1 and

g(x)=x-1. Show that $fog=gof=I_{R^{\cdot}}$

19. Show that the exponential function $f\colon R o R$, given by $f(x)=e^x$, is one-one but not onto. What happens if the co-domain is replaced by R_0^+ (set of all positive real numbers).

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20. Let
$$A=\{-1,0,1)andf=ig\{(x,x^2)\!:\!xAig\}$$
 . Show that $f\!:\!A\overrightarrow{A}$ is

neither one-one nor onto.

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21. If $f \colon A\overrightarrow{B}$ is an injection such that range of $f = \{a\}$. Determine the

number of elements in A.

22. Which of the following functions from $A \rightarrow B$ are one-one and onto? $f_1 = \{(1, 3), (2, 5), (3, 7)\}; A = \{1, 2, 3\}, B = \{3, 5, 7\}$ $f_2 = \{(2, a), (3, b), (4, c)\}; A = \{2, 3, 4\}, B = \{a, b, c\}$ $f_3 = \{(a, x), (b, x), (c, z), (d, z)\}; A = \{a, b, c, d\}, B = \{x, y, z\}$

23. Prove that the function $F\!:\!N o N,\,$ defined by $f(x)=x^2+x+1$

is one-one but not onto.

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24. Let A be any non-empty set. Then, prove that the identity function on set A is a bijection.

25. Let A=R-[2] and B=R-[1]. If $f\colon A o B$ is a mapping defined by $f(x)=rac{x-1}{x-2}$, show that f is bijective.

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26. Show that if f_1andf_1 are one-one maps from $R \to R$, then the product $f_1xf_2: R\overset{\longrightarrow}{R}$ defined by $(f_1xf_2)(x) = f_1(x)f_2(x)$ need not be one-one.

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27. Give examples of two one-one functions f_1 and f_2 from R to R such that $f_1+f_2\colon R o R$, defined by $(f_1+f_2)(x)=f_1(x)+f_2(x)$ is not

one-one.

28. If f, g: R - R are defined respectively by $f(x) = x^2 + 3x + 1, g(x) = 2x - 3$, find fog (ii) gof (iii) fof (iv) gog. Watch Video Solution

29. If the function $f: R\overrightarrow{R}$ be given by $f(x) = x^2 + 2andg: R\overrightarrow{R}$ be given by $g(x) = \frac{x}{x-1}$. Find fogandgof.

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30. If the function fandg are given by $f = \{(1, 2), (3, 5), (4, 1)\}andg = ((2, 3), (5, 1), (1, 3)\}$, find range of

fandg . Also, write down fogandgof as sets of ordered pairs.

31. Suppose f_1andf_2 are non=zero one-one functions from $R \to R$. is $\frac{f_1}{f_2}$ necessarily one-one? Justify your answer. Here, $\frac{f_1}{f_2} : R \xrightarrow{\rightarrow} R$ is given by $\left(\frac{f_1}{f_2}\right)(x) = \frac{f_1(x)}{f_2(x)}$ for all xR.

32. Find whether the following functions are one-one or not:

$$f: R \overrightarrow{g} ivenby f(x) = x^3 + 2f$$
 or $all x \in R$.
 $f: Z \overrightarrow{Z} given by f(x) = x^2 + 1f$ or $all x \in Z$.
33. If the function f and g are given by
 $f = \{(1, 2), (3, 5), (4, 1)\}$ and $g = \{(2, 3), (5, 1), (1, 3)\}$, find range
of f and g. Also write down *fog* and *gofas* set of ordered pairs.

34. Discuss the surjectivity of the following functions: $f: R \rightarrow$ given by

$$f(x)=x^3+2$$
for all $x\in R_2$

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35. Show that the function $f: Z\overline{Z}$ defined by $f(x) = x^2 + x$ for all

 $x \in Z, ext{ is a many one function.}$

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36. Let A be the set of all 50 students of class XII in a central school. Let

f: A o N be a function defined by f(x)=Roll number of student x.

Show that f is one-one but not onto

37. Show that the function $f: R \overrightarrow{R}$ defined by $f(x) = 3x^3 + 5$ for all $x \in R$ is a bijection. Watch Video Solution that the function $f\!:\!R\overrightarrow{R}$ given by 38. Show $f(x) = \cos x f$ or $all x \in R$, is neither one-one nor onto Watch Video Solution **39.** Show that the function $f: R^{\rightarrow}$ given by f(x) = xa + b, where $a, b \in R, a \neq 0$ is a bijection. Watch Video Solution

40. If
$$f(x) = rac{x}{\sqrt{1+x^2}}$$
 then $fofof(x)$

41. If
$$f(x)=rac{3x-2}{2x-3}, ext{ prove that } f(f(x)))=x ext{ for all } x\in R-\left\{rac{3}{2}
ight\}$$

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42. Show that
$$f: R\overrightarrow{R}$$
, given by $f(x) = x - [x]$, is neither one-one

nor onto.

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43. Let $f \colon R - R$ be a function given by f(x) = ax + b for all $x \in R$.

Find the constants a and b such that $fof = I_R \cdot$

44. If
$$f(x) = e^x$$
 and $g(x) = (\log)_e x(x > 0)$, find $fogandgof$. Is $fog = gof$?

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45. If
$$f:[0,\infty)\overrightarrow{R}$$
 and $g:R\overrightarrow{R}$ be defined as $f(x)=\sqrt{x}$ and $g(x)=-x^2-1,$ then find $gof and fog$.

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46. Let f and g be real functions defined by $f(x) = \frac{x}{x+1} and g(x) = \frac{1}{x+3}$. Describe the functions gof and fog (if they exist).

47. If $f(x) = \sqrt{x}(x > 0)$ and $g(x) = x^2 - 1$ are two real functions, find *fog* and *gof* is *fog* = *gof*? **Watch Video Solution 48.** Let $f: N - [1] \overrightarrow{N}$ 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*.

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49. If $f: R^{\rightarrow}$ is defined by f(x) = 2x + 7. Prove that f is a bijection.

Also, find the inverse of f_{\cdot}

50. If
$$f:\left(-rac{\pi}{2},rac{\pi}{2}
ight) o R$$
 and $g:[-1,1] o R$ be defined as $f(x)= an x$ and $g(x)=\sqrt{1-x^2}$ respectively. Describe fog and gof

51. If

$$f(x) = \sin^2 x + \sin^2 \left(x + \frac{\pi}{3} \right) + \cos x \cos \left(x + \frac{\pi}{3} \right) andg \left(\frac{5}{4} \right) = 1,$$
then $(gof)(x)$ is ______

52. Let f, g: R - R be two functions defined as f(x) = |x| + x and g(x) = |x| - x, for all x Then find fog and gof.

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53. Let $A=\{a,b,c,d\}$ and $f\colon A o A$ be given by $f=\{(a,b),(b,d),(c,a),(d,c)\}$, write f^{-1}

54. Let $f = \{(3, 1), (9, 3), (12, 4)\}$ and $g = \{(1, 3), (3, 3), (4, 9), (5, 9)\}$. Show that *gofandfog* are both defined. Also, find *fogandgof*.

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55. If
$$F:[1,\infty) \to [2,\infty)$$
 is given by $f(x) = x + \frac{1}{x}$, then $f^{-1}(x)$
equals (a) $\frac{x + \sqrt{x^2 - 4}}{2}$ (b) $\frac{x}{1 + x^2}$ (c) $\frac{x - \sqrt{x^2 - 4}}{2}$ (d) $1 + \sqrt{x^2 - 4}$

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56. Let f:R o R and g:R o R be two functions such that $fog(x)=\sin x^2$ and $gof(x)=\sin^2 x$ Then, find f(x) and g(x).

57. Let R be the set of real numbes. If $f: R\overrightarrow{R}; f(x) = x^2$ and $g: R\overrightarrow{R}; g(x) = 2x + 1$. Then, find fogandgof . Also, show that $fog \neq gof$.

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58. If
$$f(x) = -4 - (x-7)^3$$
 , write $f^{-1}(x)$.

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59. If $f: \{5, 6\} \overrightarrow{2, 3andg}: \{2, 3\}, \overrightarrow{5, 6}$ are given by $f = \{(5, 2), (6, 3)\}$ and $g = \{(2, 5), (3, 6)\}$, find fog.

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60. If a function $g = \{(1, 1), (2, 3), (3, 5), (4, 7)\}$ is described by $g(x) = \alpha x + \beta$, find the values of $\alpha and\beta$.

61. Show that $f \colon R - [0] o R - [0]$ given by $f(x) = rac{3}{x}$ is invertible

and it is inverse of itself.

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62. Let $A = \{1, 2, ..., n\}$ and $B = \{a, b\}$. Then number of surjections

from A into B is nP2 (b) 2^n-2 (c) 2^n-1 (d) nC2

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63. If
$$f: \overrightarrow{R-1, 1}$$
 is defined by $f(x) = -\frac{x|x|}{1+x^2}$, $then f^{-1}(x)$ equals $\sqrt{\frac{|x|}{1-|x|}}$ (b) $-sgn(x)\sqrt{\frac{|x|}{1-|x|}} - \sqrt{\frac{x}{1-x}}$ (d) none of these

64. Let $f: Z \to Z$ be defined by f(n) = 3n for all $n \in Z$ and $g: Z \to Z$ be defined by $g(n) = \begin{cases} rac{n}{3} & ext{if } n ext{is a multiple of 3} \\ 0 & ext{if } n ext{is not multiple of 3} \end{cases}$ for all $n \in Z$ Show that $gof = I_Z$ and $fog \neq I_Z$

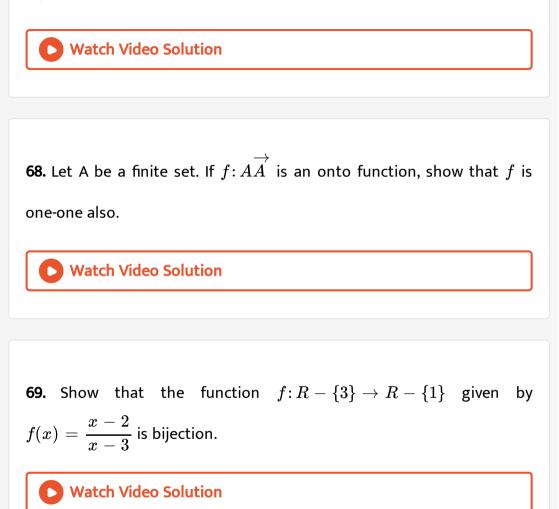
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65. Let
$$A = \{x \in R : 0 \le x \le 1\}$$
. If $f : A \to A$ is defined by
 $f(x) = \begin{cases} x & \text{if } x \in Q \\ 1-x & \text{if } x \notin Q \end{cases}$ then prove that $fof(x) = x$ for all $x \in A$.

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66. Let A=[-1,1]. Then, discuss whether the following functions from A to itself are one-one onto or bijective: $f(x)=rac{x}{2}$ (ii) g(x)=|x| (iii) $h(x)=x^2$

67. Let R be a relation on the set A of ordered pairs of positive integers defined by (x, y)R(u, v) if and only if xv = yu. Show that R is an equivalence relation.



70. Show that the function $f\!:\!R^{\longrightarrow}$ R given by $f(x)=x^3+x$ is a

bijection.



71. Let
$$f: N \cup \{0\} \rightarrow N \cup \{0\}$$
 be defined by
 $f = \begin{cases} n+1 & \text{if } n \text{ is even} \\ n-1 & \text{if } n \text{ is odd} \end{cases}$ Show that f is a bijection.

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72. Let $f \colon N - [1] \overset{
ightarrow}{N}$ be defined by, $f(n) = ext{ the highest prime factor of }$

n . Show that f is neither one-one nor onto. Find the range of f



73. Let $A = \{1,2\}$. Find all one-to-one function from A to A.

74. Let $f: R \overrightarrow{a} n dg: R \overrightarrow{R}$ be defined by f(x) = x + 1 a n dg(x) = x - 1.

Show that $fog = gof = I_{R^{\cdot}}$

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75. Verify assolativity for the following three mappings : $f\colon N o Z_0$ (the set of non zero integers), $g\colon Z_0 o Q$ and $h\colon Q o R$ given by $f(x)=2x, g(x)=rac{1}{x}$ and $h(x)=e^x$.

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76. If the set A contains 5 elements and the set B contains 6 elements,

then the number of one-one and onto mappings from A to B is



77. If the set A contains 7 elements and the set B contains 10 elements,

then the number of one-one functions from A to B is

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78.
$$f\!:\!R o R$$
 is defined by $f(x)=rac{e^{x^2}-e^{-x^2}}{e^{x^2}+e^{-x^2}}$ is :

A. (a) one-one but not onto

B. (b) many-one but onto

C. (c) one-one and onto

D. (d) neither one-one nor onto

Answer: null



79. The inverse of the function
$$f: R\overline{x \in R: x < 1}$$
 given by $f(x) = \frac{e^x - e^{-x}}{e^x + e^{-x}}$, is(a) $\frac{1}{2} \frac{\log(1+x)}{1-x}$ (b) $\frac{1}{2} \frac{\log(2+x)}{2-x}$

$$rac{1}{2}rac{\log(1-x)}{1+x}$$
 (d) None of these

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80. Let $A = \{1, 2, 3\}$. Write all one-one from A to itself.

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81. If $f: R\overrightarrow{R}$ be the function defined by $f(x) = 4x^3 + 7$, show that f is a bijection.

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82. If the function $f\colon [1,\infty) o [1,\infty)$ is defined by $f(x) = 2^{x\,(x-1)}$,

then
$$f^{-1}(x)$$
 is (A) $\left(\frac{1}{2}\right)^{x(x-1)}$ (B) $\frac{1}{2}\sqrt{1+4\log_2 x}$ (C) $\frac{1}{2}\left(1+\sqrt{1+4\log_2 x}\right)$ (D) not defined

83. The value of parameter lpha, for which the function f(x)=1+lpha x, lpha
eq 0 is the inverse of itself



84. Let R^+ be the set of all non-negative real numbers. if $f: R^+ \to R^+$ and $g: R^+ \to R^+$ are defined as $f(x) = x^2$ and $g(x) = +\sqrt{x}$. Find fog and gof. Are they equal functions.

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85. Show that the function $f\!:\!R o R$ is given by $f(x)=1+x^2$ is not

invertible.

$$86. \int_0^{\frac{\pi}{2}} \frac{2^{\sin x}}{2^{\sin x} + 2^{\cos x}} dx$$

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87. Let
$$f: [-1,\infty] \xrightarrow{\longrightarrow}$$
 is given by $f(x) = (x+1)^2 - 1, x \geq -1.$

Show that f is invertible. Also, find the set $S = ig\{x\!:\! f(x) = f^{-1}(x)ig\}$.

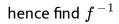
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88. Let $f: N\overrightarrow{R}$ be a function defined as $f(x) = 4x^2 + 12x + 15$. Show that $f: N\overrightarrow{S}$, where S is the range of f, is invertible. Also find the inverse of f

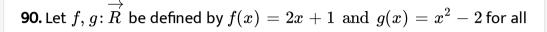
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89. Let $A = R - \{3\}$ and B = R - [1]. Consider the function $f: A\overrightarrow{B}$

defined by $f(x) = \left(rac{x-2}{x-3}
ight)$. Show that f is one-one and onto and







 $x \in R, \; {
m respectively}.$ Then, find gof

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91. Let A and B be any two sets such that n(B)=P, n(A)=q then the total

number of functions f:A
ightarrow B is equal to

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92. If $f: A \to A, g: A \to A$ are two bijections, then prove that (i) fog is an injection (ii) fog is a surjection.

93. Let $f\colon Z o Z$ be defined by f(x)=x+2. Find $g\colon Z o Z$ such that $gof=I_Z$.

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94. Which one the following relations on $A = \{1, 2, 3\}$ is function?

 $f = \{(1,3),(2,3),(3,2)\}, g = \{(1,2),(1,3),(3,1)\}$

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95. Write the domain of the real function f defined by $f(x) = \sqrt{25 - x^2}$.

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96. Let $A\Big\}x\colon -1\leq x\leq 1\Big\}andf\colon A^{\longrightarrow}$ A such that f(x)=x|x|, then f is (a) bijection (b) injective but not surjective Surjective but not

injective (d) neither injective nor surjective



97. If the function
$$f:[1,\infty) \to [1,\infty)$$
 is defined by $f(x) = 2^{x(x-1)}$, $then f^{-1}(x)$ is $\left(\frac{1}{2}\right)^{x(x-1)}$ (b) $\frac{1}{2}\left(1 + \sqrt{1 + 4(\log)_2 x}\right) \frac{1}{2}\left(1 - \sqrt{1 + (\log)_2 x}\right) (d)$ not defined

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98. If
$$f(x) = \frac{x-1}{x+1}, x \neq -1$$
, then show that $f(f(x)) = -\frac{1}{x}$ provided that $x \neq 0.1$

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99. Let f be a real function defined by $f(x)=\sqrt{x-1}$. Find $(fofof)(x)\cdot$ Also, show that $fof
eq f^2\cdot$

100. Let $f\colon R o R$ be the function defined by f(x)=4x-3 for all $x\in R.$ Then write $f^{-1}.$

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101. Find whether $f\!:\!R o R$ given by $f(x)=x^3+2$ for all $x\in R$.

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102. Find whether $f\colon Z o Z$ given by $f(x)=x^2+1$ for all $x\in Z$

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103. Show that the function $f\!:\!Z o Z$ defined by $f(x)=x^2$ for all

 $x \in Z$, is a function but not bijective function.

104. Discuss the surjectivity of $f\!:\!R o R$ given by $f(x)=x^3+2$ for

 $\mathsf{all}\; x \in R$

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105. Discuss the surjectivity of $f\!:\!R o R$ given by $f(x)=x^2+2$ for all

 $x \in R$

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106. Discuss the surjectivity of $f\colon Z o Z$ given by f(x)=3x+2 for all

 $x\in Z$.

107. Show that the function $f\!:\!N o N$ given by f(1)=f(2)=1 and

f(x)=x-1 for every $x\geq 2$, is onto but not one-one.



108. Show that the Signum function
$$f: R \to R$$
, given by
$$f(x) = \begin{cases} 1 & x > 0 \\ 0 & x = 0 \\ -1 & x < 0 \end{cases}$$
is neither one-one nor onto
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109. Prove that the function $f\!:\!Q o Q$ given by f(x)=2x-3 for all

 $x\in Q$ is a bijection.

110. Show that the function $f\!:\!R o R$ defined by $f(x)=3x^3+5$ for

all $x \in R$ is a bijection.



111. Let $A = \{x \in R : -1 \le x \le 1\} = B$. Then, the mapping $f: A \to B$ given by f(x) = x|x| is (a) injective but not surjective (b) surjective but not injective (c) bijective (d) none of these

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112. Let A be the set of all 50 students of class XII in a central school.

Let $f \colon A o N$ be a function defined by f(x) = Roll
umber of studentx

Show that f is one-one but not onto.

113. Show that the function $f\colon N o N$, given by f(x)=2x , is one-one

but not onto.



114. Prove that $f\colon R o R$, given by f(x)=2x , is one-one and onto.

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115. Show that the function $f\colon R o R$, defined as $f(x)=x^2$, is neither

one-one nor onto.



116. Show that $f\!:\!R o R$, defined as $f(x)=x^3$, is a bijection.

117. Show that the function $f: R_0 \to R_0$, defined as $f(x) = \frac{1}{x}$, is oneone onto, where R_0 is the set of all non-zero real numbers. Is the result true, if the domain R_0 is replaced by N with co-domain being same as R_0 ?

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118. Prove that the greatest integer function $f: \mathbb{R} \to \mathbb{R}$, given by f(x) = [x], is neither one-one nor onto, where [x] denotes the greatest integer less than or equal to x.

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119. Show that the modulus function $f\colon R o R$, given by f(x)=|x| is

neither one-one nor onto.

120. Let C be the set of complex numbers. Prove that the mapping $F\colon C o R$ given by $f(z)=|z|,\ orall z\in C,$ is neither one-one nor onto.



121. Show that the function $f \colon R^{\longrightarrow}$ given by f(x) = xa + b, where $a, b \in R, a \neq 0$ is a bijection.

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122. Show that the function $f\!:\!R o R$ given by $f(x)=\cos x$ for all

 $x \in R$, is neither one-one nor onto.

123. Let $A=R-\{2\}$ and $B=R-\{1\}$. If $f\colon A o B$ is a mapping defined by $f(x)=rac{x-1}{x-2}$, show that f is bijective.

124. Let A and B be two sets. Show that $f \colon A imes B o B imes A$ defined

by f(a, b) = (b, a) is a bijection.

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125. Let A be any non-empty set. Then, prove that the identity function

on set A is a bijection.

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126. Let $f: N - \{1\} \to N$ 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.

127. Let $A = \{1, 2\}$. Find all one-to-one function from A to A.

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128. Consider the identity function $I_N\colon N o N$ defined as, $I_N(x)=x$ for all $x\in N$. Show that although I_N is onto but $I_N+I_N\colon N o N$ defined as $(I_N+I_N)(x)=I_N(x)+I_N(x)=x+x=2x$ is not onto.

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129. Consider a function $f: \left[0, \frac{\pi}{2}\right] \to R$ given by $f(x) = \sin x$ and $g: \left[0, \frac{\pi}{2}\right] \to R$ given by $g(x) = \cos x$. Show that f and g are one-one, but f + g is not one-one.

130. Let $f: X \to Y$ be a function. Define a relation R in X given by $R = \{(a, b): f(a) = f(b)\}$. Examine whether R is an equivalence relation or not.

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131. Show that the function $f \colon R o \{x \in R \colon -1 < x < 1\}$ defined by

 $f(x)=rac{x}{1+|x|}, x\in R$ is one-one and onto function.

A. defined by $f(x)=rac{x}{1+|x|}, x\in R$ is one-one and onto function.

B. null

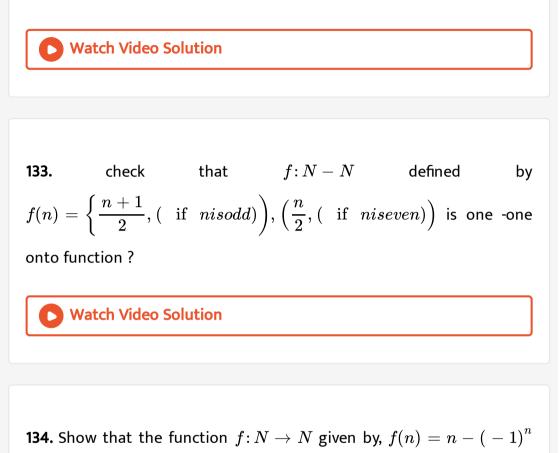
C. null

D. null

Answer: null

132. Show that the function $f\!:\!R o R$ given by $f(x)=x^3+x$ is a

bijection.



for all $n \in N$ is a bijection.



135. Let $f: N \cup \{0\} \to N \cup \{0\}$ be defined by $f(n) = \{n+1, \text{ if } n \text{ is eve } \cap -1, \text{ if } n \text{ is odd } \text{Show that } f \text{ is a bijection.}$

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136. Let A be a finite set. If $f \colon A o A$ is a one-one function, show that f

is onto also.

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137. Let A be a finite set. If $f \colon A o A$ is an onto function, show that f is

one-one also.

138. Give an example of a function which is one-one but not onto. which is not one-one but onto. (iii) which is neither one-one nor onto.

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139. Which of the following functions from A to B are one-one and onto? $f_1 = \{(1, 3), (2, 5), (3, 7)\}; A = \{1, 2, 3\}, B = \{3, 5, 7\}$ (ii) $f_2 = \{(2, a), (3, b), (4, c)\}; A = \{2, 3, 4\}, B = \{a, b, c\}$ (iii) $f_3 = \{(a, x), (b, x), (c, z), (d, z)\}; A = \{a, b, c, d\}, B = \{x, y, z\}$

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140. Prove that the function $f\colon N o N$, defined by $f(x)=x^2+x+1$

is one-one but not onto.

141. Let $A=\{\,-1,\ 0,\ 1\}$ and $f=ig\{(x,\ x^2)\!:\!x\in Aig\}$. Show that

 $f \colon A o A$ is neither one-one nor onto.



142. Classify $f\colon N o N$ given by $f(x)=x^2$ as injection, surjection or

bijection.

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143. Classify $f\colon Z o Z$ given by $f(x)=x^2$ as injection, surjection or

bijection.

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144. Classify $f\colon N o N$ given by $f(x)=x^3$ as injection, surjection or

bijection.

145. Classify $f\colon\! Z o Z$ given by $f(x)=x^3$ as injection, surjection or

bijection.

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146. Classify $f\colon R o R$, defined by f(x)=|x| as injection, surjection

or bijection.

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147. Classify $f\!:\!Z o Z$, defined by $f(x)=x^2+x$ as injection,

surjection or bijection.

148. Classify $f\colon Z o Z$, defined by f(x)=x-5 as injection, surjection or bijection.

149. Classify $f\colon R o R$, defined by $f(x)=\sin x$ as injection, surjection

or bijection.

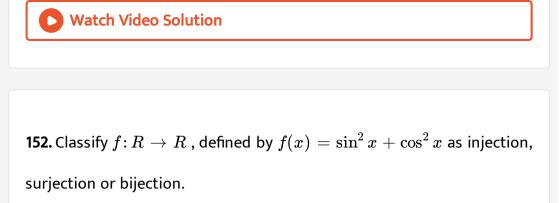
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150. Classify $f\!:\!R o R$, defined by $f(x)=x^3+1$ as injection,

surjection or bijection.



151. Classify $f\colon R o R$, defined by $f(x)=x^3-x$ as injection, surjection or bijection.



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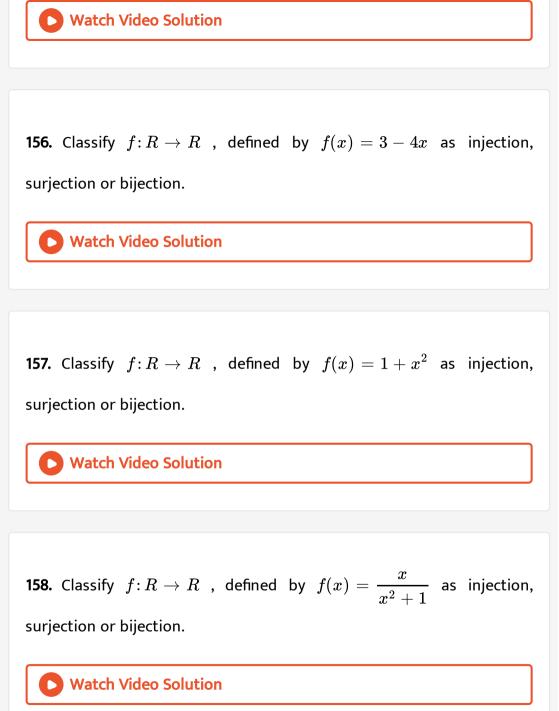
153. Classify $f \colon Q - \{3\} o Q$, defined by $f(x) = rac{2x+3}{x-3}$ as injection,

surjection or bijection.

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154. Find
$$\frac{dy}{dx}$$
 if $y^7 = x$

155. Find
$$rac{dy}{dx}$$
 if $y^3=x$



159. If $f\colon A o B$ is an injection such that range of $f=\{a\}$. Determine

the number of elements in A .



160. Show that the function $f\colon R-\{3\} o R-\{1\}$ given by $f(x)=rac{x-2}{x-3}$ is a bijection.

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161. Let $A=[-1,\ 1]$. Then, discuss whether the following functions from A to itself are one-one, onto or bijective: $f(x)=rac{x}{2}$ (ii) g(x)=|x| (iii) $h(x)=x^2$

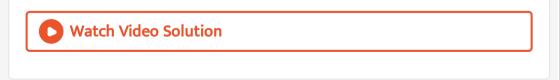
162. Are the following set of ordered pairs functions? If so, examine whether the mapping is injective or surjective: $\{(x, y) : x \text{ is a person}, y \text{ is the mother of } x\}$ (ii) $\{(a, b) : a \text{ is a person}, b \text{ is an ancestor of } a\}$



163. Let $A = \{1, 2, 3\}$. Write all one-one from A to itself.

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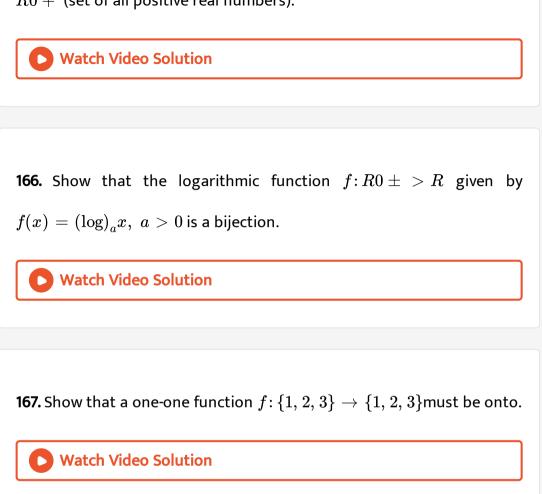
164. If $f\colon R o R$ be the function defined by $f(x)=4x^3+7$, show that f is a bijection.



165. Show that the exponential function $f\colon R o R$, given by $f(x)=e^x$

, is one-one but not onto. What happens if the co-domain is replaced by





168. If $A=\{1,\ 2,\ 3\}$, show that an onto function $f\!:\!A o A$ must be

one-one

169. Find the number of all onto functions from the set $A = \{1, 2, 3, , n\}$ to itself.



170. Give examples of two one-one functions f_1 and f_2 from R to R such that $f_1+f_2\colon R o R$, defined by $(f_1+f_2)(x)=f_1(x)+f_2(x)$ is not one-one.

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171. Give examples of two surjective function f_1 and f_2 from Z to Z such

that $f_1 + f_2$ is not surjective.



172. Show that if f_1 and f_2 are one-one maps from R to R , then the product $f_1 imes f_2\colon R o R$ defined by $(f_1 imes f_2)(x)=f_1(x)f_2(x)$ need not be one-one.

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173. Suppose f_1 and f_2 are non-zero one-one functions from R to R. Is $\frac{f_1}{f_2}$ necessarily one-one? Justify your answer. Here, $\frac{f_1}{f_2}: R \to R$ is given by $\left(\frac{f_1}{f_2}\right)(x) = \frac{f_1(x)}{f_2(x)}$ for all $x \in R$. Watch Video Solution

174. Given $A=\{2,\ 3,\ 4\}$, $B=\{2,\ 5,\ 6,\ 7\}$. Construct an example of

an injective map from A to B.

175. Given $A=\{2,\ 3,\ 4\}$, $B=\{2,\ 5,\ 6,\ 7\}$. Construct an example of

a mapping from A to B which is not injective



176. Given $A=\{2,\ 3,\ 4\}$, $B=\{2,\ 5,\ 6,\ 7\}$. Construct an example of

a mapping from A to B.

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177. Show that $f \colon R o R$, given by f(x) = x - [x] , is neither one-one

nor onto.



178. Let $f: N \to N$ be defined by: f(n)={(n+1)/2, if n is odd (n-1)/2, if n is

even Show that f is a bijection.

179. Let R be the set of real numbers. If $f\colon R o R\colon f(x)=x^2$ and $g\colon R o R; g(x)=2x+1.$ Then, find fog and gof . Also, show that fog
eq gof.

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180. Let :R o R ; $f(x) = \sin x$ and g : R o R ; $g(x) = x^2$ find fog and gof .

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181. Let $f: \{2, 3, 4, 5\} \xrightarrow{3, 4, 5, 9} andg: \{3, 4, 5, 9\} \xrightarrow{7, 11, 15}$ be functions defined at f(2)=3, f(3)=4, f(4)=f(5)=5, g(3)=g(4)=7, a n dg(5)=g(9)=11. find gof

182. Let $f: \{1, 3, 4\} \rightarrow \{1, 2, 5\}$ and $g: \{1, 2, 5\} \rightarrow \{1, 3\}$ be given by $f = \{(1, 2), (3, 5), (4, 1)\}$ and $g = \{(1, 3), (2, 3), (5, 1)\}$. Write down gof.

183. Find gof and fog , if $f\!:\!R o R$ and $g\!:\!R o R$ are given by f(x)=|x| and g(x)=|5x-2| .

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184. If the functions f and g are given by $f = \{(1, 2), (3, 5), (4, 1)\}$ and $g = \{(2, 3), (5, 1), (1, 3)\}$, find range of f and g. Also, write down *fog* and *gof* as sets of ordered pairs.

185. If the function $f\colon R o R$ be given by $f(x)=x^2+2$ and $g\colon R o R$ be given by $g(x)=rac{x}{x-1}$. Find fog and gof .

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186. 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 $A = R - \left\{\frac{7}{5}\right\}$.

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187. Find the derivative of $f(x) = x^2 - 3x + 2$.

188. If f, g: R - R are defined respectively by $f(x) = x^2 + 3x + 1, g(x) = 2x - 3$, find fog (ii) gof (iii) fof (iv) gog. Watch Video Solution

189. Let $f\colon Z o Z$ be defined by f(x)=x+2. Find $g\colon Z o Z$ such that $gof=I_Z$.

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190. If $f\colon Z o Z$ be defined by f(x)=2x for all $x\in Z$. Find $g\colon Z o Z$

such that $gof = I_Z$.



191. Let f, g and h be functions from R to R . Show that (f+g)oh = foh + goh

192. Let f, g and h be functions from R to R . Show that (fog)oh = (foh)(goh)

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193. Let $f: R \to R$ be the signum function defined as $f(x) = \{1, x > 0, 0, x = 0, -1, x < 0 \text{ and } g: R \to R \text{ be the greatest integer function given by } g(x) = [x]$. Then, prove that fog and gof coincide in [-1, 0).

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194. Let $A=\{x\in R: 0\leq x\leq 1\}$. If $f:A\overrightarrow{A}$ is defined by $f(x)=\{x, ext{ if } x\in Q, 1-x, ext{ if } x
otin Q$ then prove that fof(x)=x for all $x\in A$.

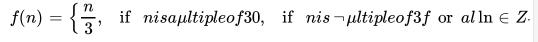
195. Let $f: R\vec{R}$ and $g: R^{\rightarrow}$ be two functions such that $fog(x) = \sin x^2 and$ gof(x)= $\sin^2 x$. Then, find f(x)andg(x).

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196. If
$$f: R \to R$$
 be given by $f(x) = \sin^2 x + \sin^2(x + \pi/3) + \cos x \cos(x + \pi/3)$ for all $x \in R$, and $g: R \to R$ be such that $g(5/4) = 1$, then prove that $gof: R \to R$ is a constant function.

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197. Let $f:Z\overrightarrow{Z}$ be defined by f(n)=3n for all $n\in Z$ and $g:Z^{\longrightarrow}$ be defined by



Show that $gof = I_Z$ and $fog
eq I_Z$



198. Let $f\colon R o R$ be a function given by f(x)=ax+b for all $x\in R$.

Find the constants a and b such that $fof = I_{R^{\cdot}}$

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199. Let $f: A \to A$ be a function such that fof = f. Show that f is onto if and only if f is one-one. Describe f in this case.

200. Let f, g: R - R be two functions defined as f(x) = |x| + x and g(x) = |x| - x , for all x Then find fog and gof.

201. Find gof and fog when $f\!:\!R o R$ and $g\!:\!R o R$ is defined by f(x)=2x+3 and $g(x)=x^2+5$

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202. Find gof and fog when $f\colon R o R$ and $g\colon R o R$ is defined by $f(x)=2x+x^2$ and $g(x)=x^3$

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203. Find fog(2) and gof(1) when: $f\!:\!R o R;\,f(x)=x^2+8$ and $g\!:\!R o R;\,g(x)=3x^3+1.$

204. Find gof and fog when $f\!:\!R o R$ and $g\!:\!R o R$ is defined by f(x)=x and g(x)=|x|

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205. Find gof and fog when $f\!:\!R o R$ and $g\!:\!R o R$ is defined by $f(x)=x^2+2x-3$ and g(x)=3x-4

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206. Find gof and fog when $f\!:\!R o R$ and $g\!:\!R o R$ is defined by $f(x)=8x^3$ and $g(x)=x^{1/3}$

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207. Let $f = \{(3, 1), (9, 3), (12, 4)\}$ and g = $\{(1, 3), (3, 3), (4, 9), (5, 9)\}$ find fog and gof.

208. Let
$$f = \{(1, -1), (4, -2), (9, -3), (16, 4)\}$$
 and

 $g = \{(-1, -2), (-2, -4), (-3, -6), (4, 8)\}$ find $gof \in$

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209. Let $A = \{a, b, c\}$, $B = \{u v, w\}$ and let f and g be two functions from A to B and from B to A respectively defined as: $f = \{(a, v), (b, u), (c, w)\}$, $g = \{(u, b), (v, a), (w, c)\}$. Show that f and g both are bijections and find fog and gof.

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210. Find fog~(2) and gof~(1) when: $f\!:\!R o R$; $f(x)=x^2+8$ and $g\!:\!R o R$; $g(x)=3x^3+1$.

211. Let R^+ be the set of all non-negative real numbers. If $f:R^+ \to R^+$ and $g:R^+ \to R^+$ are defined as $f(x)=x^2$ and $g(x)=+\sqrt{x}$. Find fog and gof. Are they equal functions.

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212. Let $f\colon R o R$ and $g\colon R o R$ be defined by $f(x)=x^2$ and g(x)=x+1 . Show that fog
eq gof.

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213. Let $f \colon R o R$ and $g \colon R o R$ be defined by f(x) = x + 1 and

$$g(x)=x-1.$$
 Show that $fog=gof=I_{R^{\cdot}}$

214. Verify assolativity for the following three mappings : $f:N\overrightarrow{Z}_0$ (the set of non zero integers), $g:Z_0\overrightarrow{Z}$ and $h:Q\overrightarrow{R}$ given by $f(x) = 2x, g(x) = \frac{1}{x}$ and $h(x) = e^x$.

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215. Consider $f: N \to N$, $g: N \to N$ and $h: N \to R$ defined as f(x) = 2x, g(y) = 3y + 4 and $h(z) = s \in z$, $\forall x$, y and z in N. Show that ho(gof) = (hog) of.

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217. Give examples of two functions $f\colon N o Z$ and $g\colon Z o Z$ such that o f is injective but is not injective. (Hint: Considerf(x) = x and g(x) = |x|)



218. If $f: A \to B$ and $g: B \to C$ are one-one functions, show that gof

is one-one function.

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219. If $f \colon A o B$ and $g \colon B o C$ are onto functions, show that gof is an

onto function.



220. If $f\!:\!R o R$ and $g\!:\!R o R$ be functions defined by $f(x)=x^2+1$ and $g(x)=\sin x,$ then find fog and gof .

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221. If $f\colon [0,\infty) o R$ and $g\colon R o R$ be defined as $f(x)=\sqrt{x}$ and $g(x)=-x^2-1,$ then find gof and fog

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222. If $f(x) = e^x$ and $g(x) = (\log)_e x(x > 0)$, find fog and gof. Is fog = gof?

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223. If $f(x) = \sqrt{x}(x > 0)$ and $g(x) = x^2 - 1$ are two real functions,

find fog and gof is fog = gof?

224. If
$$f(x) = rac{1}{x}$$
 and $g(x) = 0$ are two real functions, show that fog is

not defined.

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225. Let
$$f(x) = [x]$$
 and $g(x) = |x|$. Find $(gof)iggl(rac{5}{3}iggr) fogiggl(rac{5}{3}iggr)$

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226. Let
$$f(x) = [x]$$
 and $g(x) = |x|$. Find $(gof)iggl(rac{5}{3}iggr) fogiggl(rac{5}{3}iggr)$

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227. Let f(x) = [x] and g(x) = |x| . Find (f+2g)(-1)

228. Let fandg be real functions defined by $f(x) = rac{x}{x+1} andg(x) = rac{1}{x+3}$. Describe the functions gofandfog

(if they exist).

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229. If
$$f(x)=rac{3x-2}{2x-3},$$
 prove that $f(f(x)))=x$ for all $x\in R-\left\{rac{3}{2}
ight\}.$

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230. If
$$f(x)=rac{1}{2x+1},\ x
eq-rac{1}{2},$$
 then show that $f(f(x))=rac{2x+1}{2x+3}$, provided that $x
eq-rac{3}{2}.$

231. If
$$f(x)=rac{x}{\sqrt{1+x^2}}$$
 then $fofof(x)$

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232. Let f be a real function defined by $f(x)=\sqrt{x-1}$. Find $(fofof)(x)\cdot$ Also, show that $fof
eq f^2$.

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233. If
$$f(x)=rac{x-1}{x+1}, x
eq -1,$$
 then show that $f(f(x))=-rac{1}{x}$

provided that $x \neq 0, 1$.

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234. Find fog and gof , if $f(x) = e^x$, $g(x) = (\log)_e x$

235. Find fog and gof , if $f(x) = x^2$, $g(x) = \cos x$



236. Find fog and gof , if f(x) = |x| , $g(x) = \sin x$

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237. Find fog and gof , if f(x)=x+1 , $g(x)=e^x$

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238. Find fog and gof , if $f(x) = \sin^{-1} x$, $g(x) = x^2$

239. Find fog and gof , if f(x)=x+1 , $g(x)=\sin x$



240. Find fog and gof , if f(x) = x+1 , g(x) = 2x+3

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241. Find fog and gof , if $f(x)=c, \; c\in R$, $g(x)=\sin x^2$

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242. Find
$$fog$$
 and gof , if $f(x) = x^2 + 2$, $g(x) = 1 - rac{1}{1-x}$

243. Let $f(x)=x^2+x+1$ and $g(x)=\sin x$. Show that fog
eq gof .



244. $Letf\colon R o R\colon f(x) = |x|$, Prove that fof = f

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245. If f(x) = 2x + 5 and $g(x) = x^2 + 1$ be two real functions, then describe f^2 . Also, show that $fof
eq f^2$.

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246. If f(x)=2x+5 and $g(x)=x^2+1$ be two real functions, then describe f^2 . Also, show that $fof
eq f^2$.

247. If f(x) = 2x + 5 and $g(x) = x^2 + 1$ be two real functions, then describe f^2 . Also, show that $fof
eq f^2$.

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248. If f(x) = 2x + 5 and $g(x) = x^2 + 1$ be two real functions, then describe f^2 . Also, show that $fof
eq f^2$.

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249. If $f(x) = \sin x$ and g(x) = 2x be two real functions, then describe

gof and fog. Are these equal functions?



250. Let $f, \ g, \ h$ be real functions given by $f(x) = \sin x$, g(x) = 2x

and $h(x)=\cos x$. Prove that fog=go(fh) .

251. Let f be any real function and let g be a function given by

g(x)=2x . Prove that gof=f+f .

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252. If $f(x) = \sqrt{1-x}$ and $g(x) = (\log)_e x$ are two real functions, then

describe functions fog and gof.

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253. If $f \colon (-\pi/2,\pi/2) o R$ and $g \colon [-1,\ 1] o R$ be defined as

f(x)= an x and $g(x)=\sqrt{1-x^2}$ respectively. Describe fog and gof .

254. If $f(x) = \sqrt{x+3}$ and $g(x) = x^2 + 1$ be two real functions, then

find fog and gof .



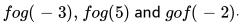
255. Let f be a real function given by $f(x)=\sqrt{x-2}$. Find fof Also, show that $fof
eq f^2$

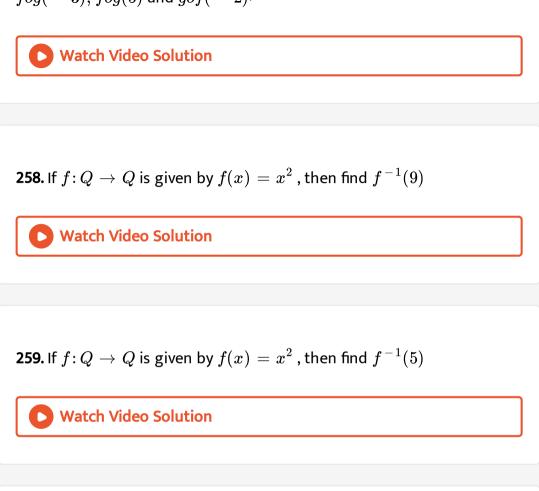
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256. Let $f(x)=1+x,\,0\leq x\leq 2$ and $f(x)=3-x,\!2< x\leq 3.$ Find f(f(x)).

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257. If f,g,:R-R be two functions defined as f(x)=|x|+x and $g(x)=|x|-x,\ orall xR,$ Then find fog and gof. Hence find





260. If $f \colon Q o Q$ is given by $f(x) = x^2$, then find $f^{-1}(0)$

261. If the function $f\colon R o R$ be defined by $f(x)=x^2+5x+9$, find $f^{-1}(8)$ and $f^{-1}(9)$.

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262. If the function $f\colon C o C$ be defined by $f(x)=x^2-1$, find $f^{-1}(-5)$ and $f^{-1}(8)$.

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263. Let $f\!:\!R o R$ be defined as $f(x)=x^2+1$. Find: $f^{-1}(10)$

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264. If $A = \{1, 2, 3, 4\}$, $B = \{2, 4, 6, 8\}$ and $f: A \to B$ is given by f(x) = 2x, then write f and f^{-1} as a set of ordered pairs.

265. Let $S = \{1, 2, 3\}$. Determine whether the functions $f: S \to S$ defined as below have inverses. Find f^{-1} , if it exists.(a) $f = \{(1, 1), (2, 2), (3, 3)\}$ (b) f = {(1, 2), (2, 1), (3, 1)}

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266. Consider $f: \{1, 2, 3\} \rightarrow \{a, b, c\}$ given by f(1) = a, f(2) = band f(3) = c. Find f^{-1} and show that $(f^{-1})^{-1} = f$.

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267. If f: R - R is defined by f(x) = 2x + 7. Prove that f is a bijection. Also, find the inverse of f.

268. Let $f\!:\!R o R$ be a function given by $f(x)=x^2+1.$ Find: $f^{-1}\{26\}$



269. Let $f\colon R o R$ be defined by f(x) = 3x - 7 . Show that f is invertible and hence find f^{-1} .

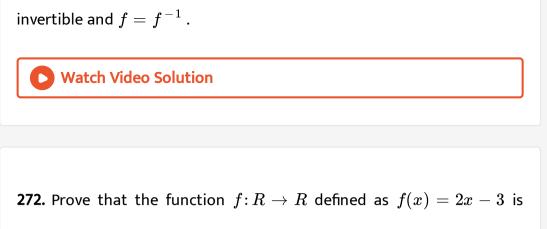
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270. Show that $f\!:\!R-[0] o R-[0]$ given by $f(x)=rac{3}{x}$ is invertible

and it is inverse of itself.



271. Let $f: N \cup \{0\} \to N \cup \{0\}$ be defined by $f(n) = \{n+1, \text{ if } n \text{ is even}, n-1, \text{ if } n \text{ is odd Show that } f \text{ is } f$



invertible. Also, find $f^{\,-1}$.

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273. Show that the function $f\!:\!R o R$ is given by $f(x)=1+x^2$ is not

invertible.

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274. Show that $f\!:\!R-\{-1\}
ightarrow R-\{1\}$ given by $f(x)=rac{x}{x+1}$ is

invertible. Also, find $f^{\,-1}$.

275. Show that $f\colon [-1,1] o R$, given by $f(x) = rac{x}{(x+2)}$ is one- one .

Find the inverse of the function f : [-1, 1]

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276. Let $f: R^{\longrightarrow}$ be defined as f(x) = 10x + 7. Find the function $g: R \stackrel{\longrightarrow}{R}$ such that $gof = fog = I_R$.

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277. If the function $f\colon [1,\infty) o [1,\infty)$ is defined by $f(x) = 2^{x\,(\,x\,-\,1\,)}\,,$

then
$$f^{-1}(x)$$
 is (A) $\left(\frac{1}{2}\right)^{x(x-1)}$ (B) $\frac{1}{2}\sqrt{1+4\log_2 x}$ (C) $\frac{1}{2}\left(1-\sqrt{1+4\log_2 x}\right)$ (D) not defined

278. The value of parameter lpha, for which the function f(x)=1+lpha x, lpha
eq 0 is the inverse of itself

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279. Let f: NY be a function defined as f(x) = 4x + 3, where $Y = \{y \in N : y = 4x + 3 \text{ for some } x \in N\}$. Show that f is invertible and its inverse is (1) $g(y) = \frac{3y + 4}{3}$ (2) $g(y) = 4 + \frac{y + 3}{4}$ (3) $g(y) = \frac{y + 3}{4}$ (4) $g(y) = \frac{y - 3}{4}$

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280. Let $Y=\left\{n^2\colon n\in N
ight\}\in N.$ Consider $f\colon N o Y$ as $f(n)=n^2.$

Show that f is invertible. Find the inverse of f.

281. Let $f: N \to R$ be a function defined as $f(x) = 4x^2 + 12x + 15$. Show that $f: N \to S$, where, S is the range of f, is invertible. Find the inverse of f.

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282. State with reason whether following functions have inverse (i) $f: \{1, 2, 3, 4\} \rightarrow \{10\} with f = \{(1, 10), (2, 10), (3, 10), (4, 10)\}$ (ii) `g: $\{5, 6, 7, 8\}$ -> $\{1,2,3,4\}$ with g= $\{(5, 4), (6, 3), (7, 4), (8, 2)\}$



283. State with reason whether following functions have inverse (i) $f: \{1, 2, 3, 4\} - \{10\} with f = \{(1, 10), (2, 10), (3, 10), (4, 10)\}$ (ii) `g: $\{5, 6, 7, 8\}$ - $\{1, 2, 3, 4\}$ with g= $\{(5, 4), (6, 3), (7, 4), (8, 2)\}$ **284.** State with reasons whether $h: \{2, 3, 4, 5\} \rightarrow \{7, 9, 11, 13\}$ with $h = \{(2, 7), (3, 9), (4, 11), (5, 13)\}$ have inverse or not

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285. Find f^{-1} if it exists: $f: A \to B$ where $A = \{0, -1, -3, 2\}$; $B = \{-9, -3, 0, 6\}$ and f(x) = 3x.

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286. Find f^{-1} if it exists: $f: A \to B$ where $A = \{1, 3, 5, 7, 9\}; B = \{0, 1, 9, 25, 49, 81\}$ and $f(x) = x^2$.

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287. Consider $f: \{1, 2, 3\} \rightarrow \{a, b, c\}$ and $g: \{a, b, c\} \rightarrow$ {apple, ball, cat} defined as f(1) = a, f(2) = b, f(3) = c, g(a) = apple, g(b) = ball and g(c) = cat. Show that f, g and gof are invertible. Find f^{-1} , g^{-1} and $(gof)^{-1}$ and show that $(gof)^{-1} = f^{-1}o g^{-1}$.

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288. Let $A = \{1, 2, 3, 4\}; B = \{3, 5, 7, 9\}; C = \{7, 23, 47, 79\}$ and $f: A \to B$, $g: B \to C$ be defined as f(x) = 2x + 1 and $g(x) = x^2 - 2$. Express $(gof)^{-1}$ and $f^{-1}o g^{-1}$ as the sets of ordered pairs and verify that $(gof)^{-1} = f^{-1} o g^{-1}$.

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289. Show that the function $f \colon Q \to Q$ defined by f(x) = 3x + 5 is invertible. Also, find f^{-1} .

290. Consider $f \colon R o R$ given by f(x) = 4x + 3. Show that f is

invertible. Find the inverse of f.

291. Consider $f: R_+ \overline{4, \infty}$ given by $f(x) = x^2 + 4$. Show that f is invertible with the inverse f^{-1} of f given by $f^{-1}(y) = \sqrt{y-4}$, where

 $R_{\,+}\,$ is the set of all non-negative real numbers.

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292. If
$$f(x) = \frac{4x+3}{6x-4}, \ x \neq \frac{2}{3},$$
 show that $fof(x) = x$ for all $x \neq \frac{2}{3}$.

What is the inverse of f?

293. Consider $f:R_\pm>[-5,\infty)$ given by $f(x)=9x^2+6x-5$. Show that f is invertible with $f^{-1}(y)=\left(rac{\left(\sqrt{y+6}
ight)-1}{3}
ight)$

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294. If $f\colon R o R$ be defined by $f(x)=x^3-3$, then prove that f^{-1} exists and find a formula for f^{-1} . Hence, find $f^{-1}(24)$ and $f^{-1}(5)$.

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295. A function $f\colon R o R$ is defined as $f(x)=x^3+4$. Is it a bijection or not? In case it is a bijection, find $f^{-1}(3)$.

296. If $f:Q o Q,\ g:Q o Q$ are two functions defined by f(x)=2x and g(x)=x+2, show that f and g are bijective maps. Verify that $(gof)^{-1}=f^{-1}\,og^{-1}$.

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

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298. Consider $f\colon R_\pm>[-9,\infty[$ given by $f(x)=5x^2+6x-9.$ Prove that f is invertible with $f^{-1}(y)=rac{\sqrt{54+5y}-3}{5}$

299. Let $f: N \xrightarrow{\longrightarrow}$ be a function defined as $f(x) = 9x^2 + 6x - 5$. Show that $f: N \xrightarrow{\longrightarrow}$, where S is the range of f, is invertible. Find the inverse of f and hence $f^{-1}(43)$ and $f^{-1}(163)$.

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300. If
$$f: R \xrightarrow{-1, 1}$$
 defined by $f(x) = \frac{10^x - 10^{-x}}{10^x + 10^{-x}}$ is invertible, find f^{-1}

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301. If
$$f\!:\!R o (0,\ 2)$$
 defined by $f(x)=rac{e^x-e^{-x}}{e^x+e^{-x}}+1$ is invertible, find f^{-1} .

302. Let
$$f: [-1, \infty] \xrightarrow{-1}$$
, is given by $f(x) = (x+1)^2 - 1, x \ge -1$.
Show that f is invertible. Also, find the set $S = \{x: f(x) = f^{-1}(x)\}$.

303. Let $A = \{x \in R \mid -1 \le x \le 1\}$ and let $f: A \to A, g: A \to A$ be two functions defined by $f(x) = x^2$ and $g(x) = \frac{\sin(\pi x)}{2}$. Show that g^{-1} exists but f^{-1} does not exist. Also, find g^{-1} .

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304. Let f be a function from R to R such that $f(x) = \cos(x+2)$. Is f invertible? Justify your answer.

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305. If $A=\{1,\ 2,\ 3,\ 4\}$ and $B=\{a,\ b,\ c,\ d\}$. Define any four

bijectives from $A \mbox{ to } B$. Also, give their inverse functions.

306. Let A and B be two sets each with a finite number of elements. Assume that there is an injective mapping from A to Band that there is an injective mapping from B to A Prove that there is a bijective mapping from A to B.

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307. If $f: \overrightarrow{AA}, g: \overrightarrow{A}$ are two bijections, then prove that fog is an injection (ii) fog is a surjection.

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308. If $f \colon A o A, \;\; g \colon A o A$ are two bijections, then prove that fog is

an surjection.

309. Which one of the following graphs represent a function? (FIGURE)

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310. Which one of the following graphs represent a one-one function?

(FIGURE)

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311. Let $A = \{1, 2\}$ and $B = \{a, b\}$ be two sets. Write total number of

one-one functions from A to B .



312. Write total number of one-one functions from set $A = \{1, 2, 3, 4\}$ to set $B = \{a, b, c\}$.

313. If $f\colon R o R$ is defined by $f(x)=x^2$, write $f^{\,-1}(25)$.

314. If $f\colon C o C$ is defined by $f(x)=x^2$, write $f^{-1}(-4)$. Here, C

denotes the set of all complex numbers.

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315. If $f\colon R o R$ is given by $f(x)=x^3$, write $f^{-1}(1)$.

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316. Let C denote the set of all complex numbers. A function $f\colon C o C$ is defined by $f(x)=x^3$. Write $f^{-1}(1)$.

317. Let f be a function from C (set of all complex numbers) to itself given by $f(x)=x^3$. Write $f^{-1}(1)$.

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318. Let $f\!:\!R o R$ be defined by $f(x)=x^4$, write $f^{\,-1}(1)$.

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319. Find the derivative of $f(x) = x^4$

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320. If $f\!:\!R o R$ is defined by $f(x)=x^2$, write $f^{\,-1}(25)$.

321. If
$$f\colon C o C$$
 is defined by $f(x)=\left(x-2
ight)^3$, write $f^{\,-1}(\,-1)$.



322. If $f\!:\!R o R$ is defined by f(x)=10x-7 , then write $f^{\,-1}(x)$.

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323. Let
$$f\!:\!\left\{-rac{\pi}{2},\;rac{\pi}{2}
ight\}
ightarrow R$$
 be a function defined by $f(x)=\cos[x]$. Write range (f) .

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324. If $f\!:\!R o R$ defined by f(x)=3x-4 is invertible then write $f^{-1}(x)$.

325. If $f\colon R o R$, $g\colon R o R$ are given by $f(x)=(x+1)^2$ and $g(x)=x^2+1$, then write the value of $fog\ (-3)$.

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326. Let
$$A=\{x\in R\colon -4\leq x\leq 4 ext{ and } x
eq 0\}$$
 and $f\colon A o R$ be defined by $f(x)=rac{|x|}{x}$. Write the range of f .

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327. Let
$$f:\left[-rac{\pi}{2}, rac{\pi}{2}
ight] o A$$
 be defined by $f(x)=\sin x$. If f is a bijection, write set A .

328. Let $f\colon R o R^+$ be defined by $f(x)=a^x,\;a>0$ and a
eq 1 . Write $f^{-1}(x)$.

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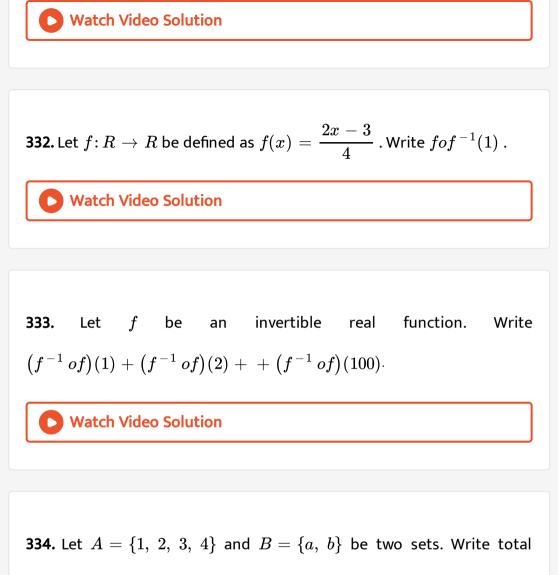
329. Let
$$f\colon R-\{-1\} o R-\{1\}$$
 be given by $f(x)=rac{x}{x+1}$. Write $f^{-1}(x)$.

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330. Let
$$f: R - \left\{-\frac{3}{5}\right\} \to R$$
 be a function defined as $f(x) = \frac{2x}{5x+3}$. Write f^{-1} : Range of $f \to R - \left\{-\frac{3}{5}\right\}$.

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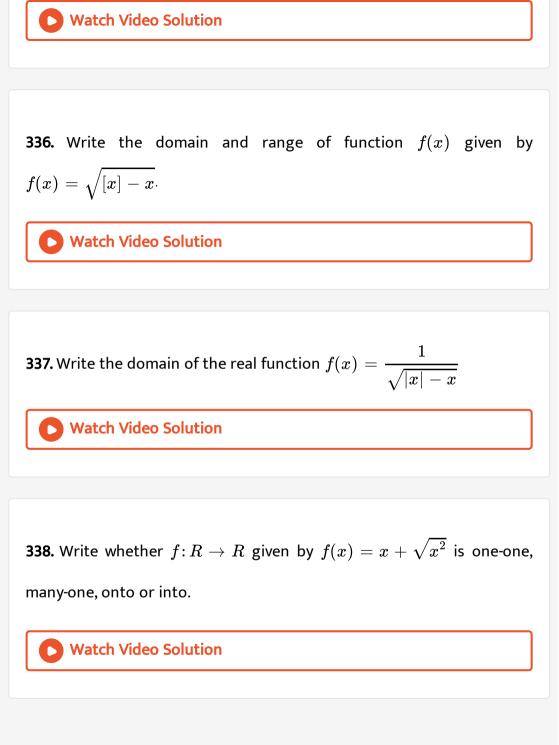
331. Let $f\!:\!R o R$, $g\!:\!R o R$ be two functions defined by $f(x)=x^2+x+1$ and $g(x)=1-x^2$. Write $fog\,(-2)$.

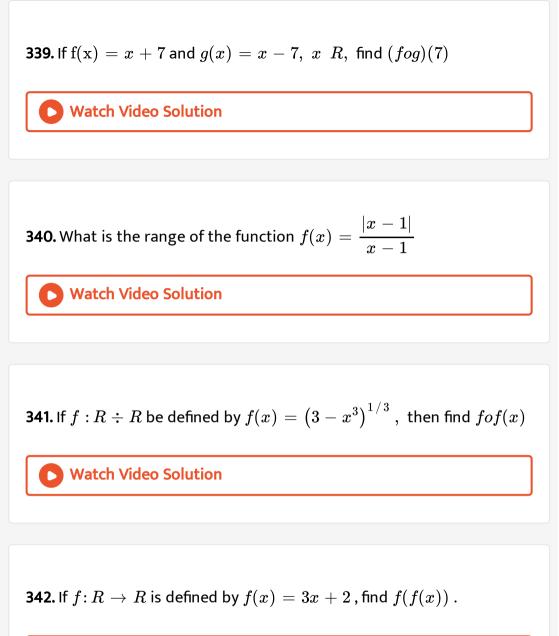


number of onto functions from $A \mbox{ to } B$.

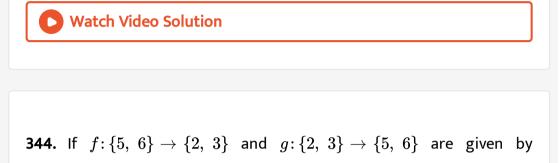
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335. Write the domain of the real function $f(x) = \sqrt{x - [x]}$.





343. Let $A = \{1, 2, 3\}, B = \{4, 5, 6, 7\}$ and let $f = \{(1, 4), (2, 5), (3, 6)\}$ be a function from A to B. State whether f is one-one or not.



 $f = \{(5, \ 2), \ (6, \ 3)\}$ and $g = \{(2, \ 5), \ (3, \ 6)\}, \ {
m find} \ fog$.

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345. Let $f\!:\!R o R$ be the function defined by f(x)=4x-3 for all

 $x\in R$. Then write $f^{\,-1}$.

346. Which one the following relations on $A = \{1, 2, 3\}$ is a function? $f = \{(1, 3), (2, 3), (3, 2)\}, g = \{(1, 2), (1, 3), (3, 1)\}$

347. Write the domain of the real function f defined by $f(x) = \sqrt{25 - x^2}$.

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348. Let
$$A = \{a, b, c, d\}$$
 and $f: A\overrightarrow{A}$ be given by $f = \{(a, b), (b, d), (c, a), (d, c)\}$, write f^{-1} .

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349. Let $f,g\colon R^{\longrightarrow}$ be defined by $f(x)=2x+1 and g(x)=x^2-2$ for all $x\in R,$ respectively. Then, find gof.

350. If the mapping $f: \{1, 3, 4\} \rightarrow \{1, 2, 5\}$ and $g: \{1, 2, 5\} \rightarrow \{1, 3\}$, given by $f = \{(1, 2), (3, 5), (4, 1)\}$ and $g = \{(2, 3), (5, 1), (1, 3)\}$, write fog.

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351. If a function $g = \{(1, 1), (2, 3), (3, 5), (4, 7)\}$ is described by $g(x) = \alpha x + \beta$, find the values of $\alpha and\beta$.

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352. If
$$f(x) = -4 - (x-7)^3$$
 , write $f^{-1}(x)$.

353. Let $A = \{x \in R: -1 \le x \le 1\} = B$ and $C = \{x \in R: x \ge 0\}$ and let $S = \{(x, y) \in A \times B: x^2 + y^2 = 1\}$ and $S_0 = \{(x, y) \in A \times C: x^2 + y^2 = 1\}$. Then S defines a function from A to B (b) S_0 defines a function from A to C (c) S_0 defines a function from A to B (d) S defines a function from A to C

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354. $f \colon R o R$ given by $f(x) = x + \sqrt{x^2}$ is (a) injective (b) surjective

(c) bijective (d) none of these

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355. If $f \colon A o B$ given by $3^{f(x)} + 2^{-x} = 4$ is a bijection, then A

356. The function f: R o R defined by $f(x) = 2^x + 2^{|x|}$ is (a) one-one and onto (b) many-one and onto (c) one-one and into (d) many-one and into

357. Let the function $f:R-\{-b\} o R-\{1\}$ be defined by $f(x)=rac{x+a}{x+b}$, a
eq b , then (a) f is one-one but not onto (b) f is onto

but not one-one (c) f is both one-one and onto (d) none of these

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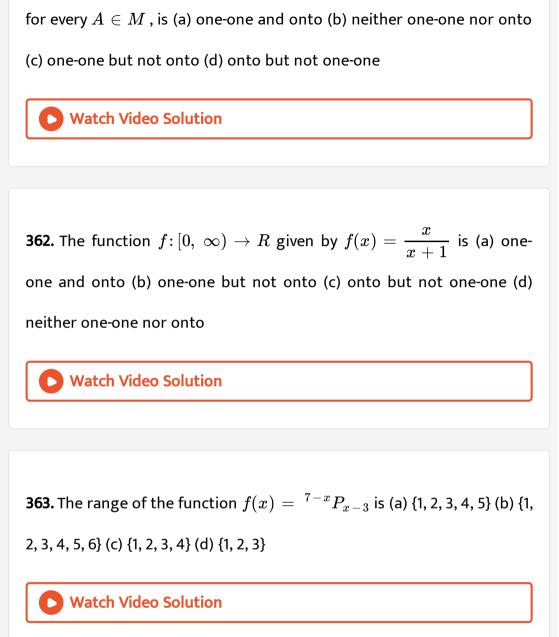
358. The function $f: A \to B$ defined by $f(x) = -x^2 + 6x - 8$ is a bijection, if $A = (-\infty, 3]$ and $B = (-\infty, 1]$ (b) $A = [-3, \infty)$ and $B = (-\infty, 1]$ (c) $A = (-\infty, 3]$ and $B = [1, \infty)$ (d) $A = [3, \infty)$ and $B = [1, \infty)$ **359.** Let $A = \{x \in R: -1 \le x \le 1\} = B$. Then, the mapping $f: A \to B$ given by f(x) = x|x| is (a) injective but not surjective (b) surjective but not injective (c) bijective (d) none of these

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360. Let $f: R \to R$ be given by $f(x) = [x]^2 + [x+1] - 3$, where [x] denotes the greatest integer less than or equal to x. Then, f(x) is (a) many-one and onto (b) many-one and into (c) one-one and into (d) one-one and onto

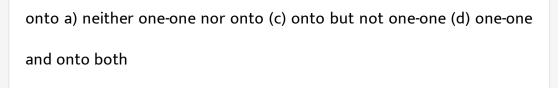
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361. Let M be the set of all 2 imes 2 matrices with entries from the set R of real numbers. Then the function $f\colon M o R$ defined by f(A)=|A|



364. A function f from the set of natural numbers to integers is defined

by n when n is odd f(n) = 3, when n is even Then f is (b) one-one but not





365. Let f be an injective map. with domain (x, y, z and range (1, 2, 3), such that exactly one following statements is correct and the remaining are false : f(x) = 1, $f(y) \neq 1$, $f(z) \neq 2$ The value of $f^{-1}(1)$ is

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366. Which of the following function from Z to itself are bijections?

$$f(x)=x^3$$
 (b) $f(x)=x+2$ $f(x)=2x+1$ (d) $f(x)=x^2+x$

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367. Let A = [-1, 1]. Then, discuss whether the following functions

from A to itself are one-one onto or bijective: $f(x)=rac{x}{2}$ (ii) g(x)=|x|

(iii) $h(x)=x^2$

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368. Let $A\{x: -1 \le x \le 1\}$ and $f: A^{\rightarrow}$ such that f(x) = x|x|, then f is (a) bijection (b) injective but not surjective (c)Surjective but not injective (d) neither injective nor surjective

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369. If the function
$$f: R\overrightarrow{A}$$
 given by $f(x) = rac{x^2}{x^2+1}$ is surjection, then

find A

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370. If a function $f:[2, \infty) \to R$ defined by f(x) = (x-1)(x-2)(x-3) is (a) one-one but not onto (b) onto but not one-one (c) both one and onto (d) neither one-one nor onto

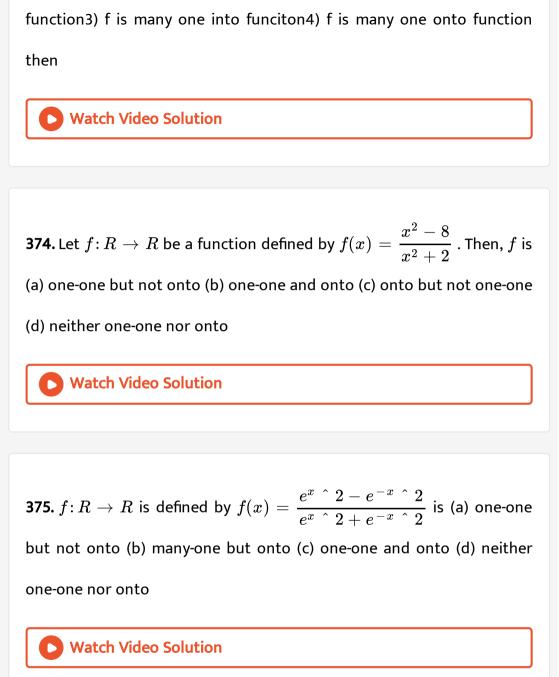
371. The function $f: [-1/2, 1/2] \rightarrow [-\pi/2, \pi/2]$ defined by $f(x) = \sin^{-1}(3x - 4x^3)$ is (a) bijection (b) injection but not a surjection (c) surjection but not an injection (d) neither an injection nor a surjection

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372. Let $f: R \to R$ be a function defined by $f(x) = \frac{e^{|x|} - e^{-x}}{e^x + e^{-x}}$ then --(1) f is bijection (2) f is an injection only (3) f is a surjection (4) f is neither injection nor a surjection



373. Let $f: R - \{n\} \to R$ be a function defined by $f(x) = \frac{x - m}{x - n}$ such that $m \neq n$ 1) f is one one into function2) f is one one onto



376. The function $f:R \to R$, $f(x) = x^2$ is (a) injective but not surjective (b) surjective but not injective (c) injective as well as surjective (d) neither injective nor surjective

377. A function f from the set of natural numbers to integers defined by

$$f(n) = \left\{rac{n-1}{2}, \ when \ n \ is \ odd - rac{n}{2}, \ when \ n \ is \ even \ ext{is }$$
 (a) neither

one-one nor onto (b) one-one but not onto (c) onto but not one-one (d)

one-one and onto both

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378. Which of the following functions from
$$A = \{x \in R: -1 \le x \le 1\}$$
 to itself are bijections? $f(x) = |x|$ (b) $f(x) = \sin\left(\frac{\pi x}{2}\right)$ (c) $f(x) = \sin\left(\frac{\pi x}{4}\right)$ (d) none of these

379. Let $f: Z \to Z$ be given by $f(x) = \left\{\frac{x}{2}, \text{ if } x \text{ is even}, 0, \text{ if } x \text{ is odd} \text{ . Then, f is (a) onto but} \text{ not one-one (b) one-one but not onto (c) one-one and onto (d) neither one-one nor onto$

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380. The function $f: R \to R$ defined by $f(x) = 6^x + 6^{|x|}$ is (a) oneone and onto (b) many one and onto (c) one-one and into (d) many one and into

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381. Let $f(x) = x^2$ and $g(x) = 2^x$. Then the solution set of the equation fog(x) = gof(x) is (a)R (b) {0} (c) {0, 2} (d) none of these

382. If f(x) = 3x - 5, then $f^{-1}(x)$ (a) is given by $\frac{1}{(3x - 5)}$ (b) is given by $\frac{(x + 5)}{3}$ (c) does not exist because f is not one-one (d) does not exist because f is not onto

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383. If
$$g(f(x)) = |\sin x| and f(g(x)) = \left(\sin \sqrt{x}
ight)^2$$
 , then

$$(a). \ f(x) = \sin^2 x, \ g(x) = \sqrt{x}$$
 $(b). \ f(x) = \sin x, \ g(x) = |x|$

$$(c)fig(x=x^2,g(x)=\sin\sqrt{x}\,(d).\,f\,andg$$
 cannot be determined

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384. The inverse of the function $f: Rx \in R: x < 1$ given by $f(x) = \frac{e^x - e^{-x}}{e^x + e^{-x}}$, is $\frac{1}{2} \frac{\log(1+x)}{1-x}$ (b) $\frac{1}{2} \frac{\log(2+x)}{2-x} = \frac{1}{2} \frac{\log(1-x)}{1+x}$

(d) None of these

385. If the function
$$f:(1,\infty)^{\to}(1,\infty)$$
 is defined by
 $f(x) = 2^{x(x-1)}, then f^{-1}(x)$ is $\left(\frac{1}{2}\right)^{x(x-1)}$ (b)
 $\frac{1}{2}\left(1 + \sqrt{1 + 4(\log)_2 x}\right) \frac{1}{2}\left(1 - \sqrt{1 + (\log)_2 x}\right)$ (d) not defined

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386. Let
$$A=\{x\in R\colon x\leq 1\}$$
 and $f\colon A o A$ be defined as $f(x)=x(2-x).$ Then, $f^{-1}(x)$ is: (a) $1+\sqrt{1-x}$ (b) $1-\sqrt{1-x}$ (c) $\sqrt{1-x}$ (d) $1\pm\sqrt{1-x}$

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387. Let $f(x)=rac{1}{1-x}$. Then, $\{f \ o \ (f \ o \ f)\}(x)=(a)x$ for all $x\in R$ (b) x for all $x\in R-\{1\}$ (c) x for all $x\in R-\{0,\ 1\}$ (d) none of these **388.** If the function $f\colon R o R$ be such that $f(x)=x-[x],\,$ where [x]

denotes the greatest integer less than or equal to $x, ext{ then } f^{-1}(x)$ is

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389. If
$$F:[1,\infty)\overrightarrow{2,\infty}$$
 is given by $f(x)=x+\frac{1}{x}, then f^{-1}(x)$ equals. $\frac{x+\sqrt{x^2-4}}{2}$ (b) $\frac{x}{1+x^2}$ (c) $\frac{x-\sqrt{x^2-4}}{2}$ $1+\sqrt{x^2-4}$

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390.

Let

 $g(x) = 1 + x - [x] and f(x) = \{ -1, x < 0; 0, \hspace{1em} ext{if} \hspace{1em} x = 0; 1, \hspace{1em} ext{if} \hspace{1em} x > 0$

. Then for all x, f(g(x)) is equal to (where [.] represents the greatest integer function). (a) x (b) 1 (c) f(x) (d) g(x)

391. Let $f(x)=rac{lpha x}{(x+1)}, x
eq -1$. for what value of lpha is f(f(x))=x? (a) $\sqrt{2}$ (b) $-\sqrt{2}$ (c) 1 (d) -1

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392. The distinct linear functions which map [-1, 1] onto [0, 2] are $f(x)=x+1,\ g(x)=-x+1$ (b) $f(x)=x-1,\ g(x)=x+1$ (c) $f(x)=-x-1,\ g(x)=x-1$ (d) none of these

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393. If $f\colon [2,\infty) o (-\infty,4],$ where f(x)=x(4-x) then find $f^{-1}(x)$

394. If
$$f: R \rightarrow 1, 1$$
 is defined by $f(x) = -\frac{x|x|}{1+x^2}$, $then f^{-1}(x)$ equals $\sqrt{\frac{|x|}{1-|x|}}$ (b) $-sgn(x)\sqrt{\frac{|x|}{1-|x|}} - \sqrt{\frac{x}{1-x}}$ (d) none of these

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395. Let [x] denote the greatest integer less than or equal to x. If $f(x) = \sin^{-1}x$, $g(x) = [x^2]$ and h(x) = 2x, $\frac{1}{2} \le x \le \frac{1}{\sqrt{2}}$, then $fogoh(x) = \pi/2$ (b) $fogoh(x) = \pi$ (c) hofog = hogof (d) $hofog \neq hogof$

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396. If $g(x)=x^2+x-2andrac{1}{2}gof(x)=2x^2-5x+2,\,$ then which is not a possible f(x)? (a)2x-3 (b) -2x+2 (c)x-3 (d) None of these

397. If $f(x)=\sin^2 x$ and the composite function $g(f(x))=|\sin x|$, then g(x) is equal to (a) $\sqrt{x-1}$ (b) \sqrt{x} (c) $\sqrt{x+1}$ (d) $-\sqrt{x}$



398. Let $f\colon R o R$ be given by $f(x)=x^2-3$. Then, f^{-1} is given by $\sqrt{x+3}$ (b) $\sqrt{x}+3$ (c) $x+\sqrt{3}$ (d) none of these

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399. Let $f(x) = x^3$ be a function with domain {0, 1, 2, 3}. Then domain of f^{-1} is (a) {3, 2, 1, 0} (b) {0, -1, -2, -3} (c) {0, 1, 8, 27} (d) {0, -1, -8, -27}

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400. Let $f\colon R o R$ be given by $f(x)=x^2-3$. Then, f^{-1} is given by $(a)\sqrt{x+3}$ (b) $\sqrt{x}+3$ (c) $x+\sqrt{3}$ (d) none of these

401. Let f:R o R be given by f(x)= an x . Then, $f^{-1}(1)$ is $rac{\pi}{4}$ (b) $\left\{n\pi+rac{\pi}{4}:n\in Z
ight\}$ (c) does not exist (d) none of these

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402. Let $f: R \to R$ be defined as f(x)={ 2x, if x>3, x^2 if x is less than 1.

Find value of f(-1)+f(4)

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403. Let $A = \{1, 2, ..., n\}$ and $B = \{a, b\}$. Then number of subjections

from A into B is n_P _ 2(b) 2^n - 2 (c) 2^n - 1 (d) nC2

404. If the set *A* contains 5 elements and the set B contains 6 elements, then the number of one-one and onto mappings from A to B is (a) 720 (b) 120 (c) 0 (d) none of these

405. If the set A contains 7 elements and the set B contains 10 elements, then the number of one-one functions from A to B is (a) 10C7 (b) 10C7 x 7! (c) 7^{10} (d) 10^7

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406. Let
$$f: R - \left\{\frac{3}{5}\right\} \to R$$
 be defined by $f(x) = \frac{3x+2}{5x-3}$. Then
(a) $f^{-1}(x)=f(x)$, (b) $f^{-1}(x)=-f(x)$, (c), (fof)=x (d), $f^{-1}(x)=(1/19)f(x)$