MATHS

BOOKS - BHARATI BHAWAN MATHS (HINGLISH)

Function

Example

1. ABCD is a square of side a. A line parallel to the diagonal BD at a distance x from the vertex A cuts the two adjacent sides. Express the area of the segment of the square with A at a vertex, as a function of x.

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2. If $f(x)$ is a polynomial function satisfying $f(x)f\left(\frac{1}{x}\right) = f(x) + f\left(\frac{1}{x}\right)$ and $f(4) = 65, then f \in df(6)$.

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3. Find the domain of the function

$$f(x) = \frac{1}{\sqrt{[x]^2 - [x] - 6}}$$

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4. The domain of definition of the function $f(x) = \sqrt{3 - 2^x - 2^{1-x}} + \sqrt{\sin^{-1} x}$ is

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5. Find the domain and range of

$$f(x) = \frac{9x^2 - x + 2}{x^2 + x - 6}.$$

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6. Find the domain and range of the function

$$f(x) = \sqrt{2 - x} + \sqrt{1 + x}$$

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7. If $f: R \to R$, $f(x) = \frac{\alpha x^2 + 6x - 8}{\alpha + 6x - 8x^2}$ is onto then $\alpha \in$

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8. If f(x) satisfies the relation, f(x+y)=f(x)+f(y) for all x,y $\in$ R and f(1)=5, then find $\sum_{n=1}^{m} f(n)$. Also, prove that f(x) is odd.

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9. If a, b are two fixed positive integers such that $f(a+x)=b+\left[b^3+1-3b^2 f(x)+3b\{f(x)\}^2-\{f(x)\}^3\right]^{\frac{1}{3}}$ for all real x, then prove that $f(x)$ is periodic and find its period.

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10. If the functions f, g and h are defined from the set of real numbers R to R such that

$f(x)=x^2-1, g(x)=\sqrt{\left(x^2+1\right)},$

$h(x) = \begin{cases} 0, & \text{if } x \leq 0 \\ \text{x}, & \text{if } x \geq 0 \end{cases}$

Then find the composite function hofog and determine whether the function fog is invertible and h is the identity function.

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Exercise

1. Let $f(x) = \frac{ax+b}{cx+d}, x \neq -\frac{d}{c}$.

If d=-a,

show that f{(x)}=x is an identity.

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2. If f(x)=$\log_e\left(x+\sqrt{1+x^2}\right)$, $g(x) = \log_e\left(1+\sqrt{1+x^2}\right)$and

h(x)=f(x)-g(x) then prove $h\left(\frac{1}{x}\right) = -h(x)$.

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3. Find the natural number a for which $\sum_{k=1}^{n} f(a+k) = 16(2^n - 1)$ where the function f satisfies the relation $f(x+y) = f(x).f(y)$ for all natural numbers and also $f(1) = 2$

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4. Find the domain of $f(x) = \sqrt{x^2 - 4x + 3}$

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5. Find the domain of $f(x) = \frac{1}{\sqrt{x^2 - x - 2}}$

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6. Find the domain of $f(x) = \frac{1}{\sqrt{x - |x|}}$

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7. Find the domain of $f(x) = \sqrt{\frac{(x+1)(x-3)}{x-2}}$

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8. Find the domain of $f(x) = \sqrt{\log_{10}\left(\frac{3-x}{x}\right)}$

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9. Find the domain of $f(x) = \sin^{-1}\left\{\log_2\left(\frac{1}{2}x^2\right)\right\}$

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10. Find the domain of $y = \cos^{-1}\left(\frac{3+\sin x}{4}\right)$

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11. Find the domain of $f(x) = \sqrt{5(|x| - x^2 - 6)}$

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12. Find the domain of $y = \cos^{-1}\{x[x[\}$

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13. Find the domain of $f(x) = \log_2 x - 5(x - 3x - 10)$

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14. Find the domain of the real-valued functions:

$f(x) = \sqrt{4 - x} + \sqrt{x - 5}$

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15. Find the domain of the real-valued functions:

$f(x) = \sqrt{3 - x} + \cos^{-(1)}\left(\frac{3 - 2x}{5}\right)$

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16. Find the domain of the real-valued functions:

$$y = \sin^{-1} x + \sqrt{2x - x^2} - \frac{1}{\sqrt{8x - 4x^2 - 3}}$$

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17. If $\log_x y . \log_{xy} y . \log_{x^2 y} y = \frac{1}{6}$ then express y as the real function of x and indicate the domain of definition

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18. f(x) is defined over [0,1]. Find the domain of the function f(2x+3)

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19. The function $f(x)$ is defined on the interval $[0, 1]$. Find the domain of definition of the functie $f(\sin x)$

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20. f(x) is defined over [0,1]. Find the domain of the function f(cosx)

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21. Find the domain and range of the function $y = \log_e\left(3x^2 - 4x + 5\right)$.

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22. Find the domain and range of the function $f(x) = \frac{x}{1+x^2}$

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23. Find the domain and range of the function i. $f(x) = \frac{x}{|x|}$ and ii. $f(x) = \frac{x^2-1}{x-1}$

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24. Find the domain and range of the following $y = |x-4| + |x-3| + |x-2| + |x-1|$

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25. Find the domain and range of the following $f(x) = \frac{1}{3 - \cos 2x}$

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26. Let f : {x,y, z} $\rightarrow$ {a, b, c} be a one-one function. If it is known that only one of the following statements is true,

(i) $f(x) \neq b$ (ii) $f(y) = b$

(iii) $f(z) \neq a$

Determine $f^{-1}(b)$.

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27. Prove that the product of two odd functions is an even function while their sum is an odd function.

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28. Prove that $f(x)=\sqrt[3]{1-(x)^2}+\sqrt[3]{1+(x)^2}$ is an even function

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29. Extend $f(x)=x^2+x$ defined in [0,3] onto the interval[-3,3] so that f(x) is even

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30. Period of $|\sin x+\cos x|$ is

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31. If $f(x) \in [1, 2]$ where $x \in R$ and for a fixed positive real number p, $f(x+p) = 1 + \sqrt{2f(x) - \{f(x)\}^2}$ for all $x \in R$ then prove that $f(x)$ is a periodic function

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32. Let f (x) and g(x) be increasing and decreasing functions respectively from $[0, \infty) \text{to} [0, \infty)$ Let h (x) = fog (x) If h(0) =0 then h(x) is

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33. Computer the inverse of the function :

$f(x) = \left(x + \sqrt{x^2 + 1}\right)$

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34. If $f(x) = 1 - \frac{x}{1+x}$, x not equal to -1 then f{f(1/x)}=`____

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35. If $f(x) = \cos(\log x)$, then $f(x)f(y) - \frac{1}{2}\left[f\left(\frac{x}{y}\right) + f(xy)\right]$=

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36. If $f(x) = \frac{x+1}{x}$ and $\phi(x) = \frac{x^4+1}{x^4}$ then $\phi(a) =$ _ ——

where f(a)=5.

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37. If f(x) is a polynomial function of the second degree such tha f(0)=5, f(-1)=10 and f(1)= 6 then f(x)=____.

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38. If $f(x+1) = x^2 - 3x + 2$ then $f(x)$ is equal to

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39. If f is an even function defined on the interval $(-5, 5)$, then four real values of x satisfying the equation $f(x) = f\left(\frac{x+1}{x+2}\right)$ are _____, _____, _____ and_____.

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40. If f(x) is a periodic function of the period k then f(ax+b) is a periodic function of the period____.

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41. The value of $f(x) = 3\sin\left(\frac{\pi^2}{16} - x^2\right)$ lie in the interval___

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42. If $f: R \to R$ be a function given $f(x) = \sqrt{1} - \sqrt{1 - x^2}$then the domain of the interval _____.

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43. If the function $f:[2, +\propto) \to X$ be bijective wheras $f(x) = 5 - 4x + x^2$ then X_____.

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44. Find the domain $f(x) = \log_{100x}\left(\frac{2\log_{10} x + 1}{-x}\right)$

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45. If $f(x) = \sin^2 x + \sin^2\left(x + \frac{\pi}{3}\right) + \cos x \cos\left(x + \frac{\pi}{3}\right) and g\left(\frac{5}{4}\right) = 1,$ then $(gof)(x)$ is _____

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46. If $f(x) = \frac{x+2}{x-1} = y$ then

A. $x = f(y)$

B. $f(1) = 3$

C. $f(y) = 2f(x)$

D. $f(y) = 2 + f(x)$

Answer: A

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47. If $f(x) = \cos\left[\pi^2\right]x + \cos\left[-\pi^2\right]x$, where $[x]$ stands for the greatest integer function, then

A. $f(\pi/2) = -1$

B. $f(\pi) = 1$

C. $f(-\pi) = 0$

D. $f(\pi/4) = 2$

Answer:

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48. Let $f(x) = \log\left(x + \sqrt{x^2 + 1}\right)$, then f'(x) equals.

A. periodic

B. even function

C. odd function

D. none of these

Answer:

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49. If $f(x) = \log\left(\frac{1+x}{1-x}\right)$, then f $\left(\frac{2x}{1+x^2}\right)$ is equal to

A. $f(x_1).\ f(x_2) = (x_1 + x_2)$

B. f(x) is odd

C. $f(x_1) + f(x_2) = f\left(x_1 + \frac{x_2}{1} + x_1x_2\right)$

D. f(x) is even

Answer:

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50. Let g(x) be a function defined on [-1,1]. If the area of the equilateral triangle with two of its vertices at $(0, 0)$ and $(x, g(x))$ is $\frac{\sqrt{3}}{4}$.then the function g(x) is:

A. $+\sqrt{1}-x^2$

B. $\sqrt{1}-x^2$

C. $-\sqrt{1}-x^2$

D. sqrt1+x^2`

Answer:

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51. Find the real values of x for which the function $f(x)=\cos^{-1}\sqrt{x^2+3x+1}+\cos^{-1}\sqrt{x^2+3x}$ is defined

A. [0,3]

B. interval [0,3]

C. [0,-3]

D. interval[-3,0]

Answer:

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52. If $f(x) = \sin x + \cos ax$ is a periodic function, show that a is a rational number

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53. The function $f(x) = x[x]$, is

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54. If $f(x) = \frac{1-x}{1+x}$,x>0 then the least value of $f(f(x)) + f\left\{f\left(\frac{1}{x}\right)\right\} is$_____

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55. If $f(x) = \frac{1}{x^2 + x + 1}$, then the function $f: R \to R$ is

A. one- one

B. many-one

C. into

D. onto

Answer:

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56. Consider a real-valued function f(x) satisfying $2f(xy) = (f(x))^y + (f(y))^x \forall x, y \in Rand(1) = a, wherea \neq 1.$ Prove that $(a-1)\sum_{i=1}^{n} f(i) = a^{n+1} - a$

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57. If $f(a-x)=f(a+x)$ and $f(b-x)=f(b+x)$ for all real x, where $a, b(a>b>0)$ are constants, then prove that $f(x)$ is a periodic function.

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