



MATHS

BOOKS - PATHFINDER MATHS (BENGALI ENGLISH)

FUNCTIONS

Question Bank

1. Let the question $f(x) = \log x^2$ and $\phi(x) = 2\log x$, then

A. a) $f(x) \leq \phi(x)$

B. b) $f(x) \neq \phi(x)$

C. c) $f = \phi$

D. d) $f \neq \phi$

Answer: D



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2. If $f(x) = (p - x^n)^{\frac{1}{n}}$, $p > 0$ and n is positive integer, then the value of $f[f(x)]$

A. a) $-x$

B. b) x^2

C. c) x

D. d) $x + a$

Answer: C



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3. The range of the function $\frac{x}{2 + x^2}$ is

A. $\left[\frac{1}{2\sqrt{2}}, -\frac{1}{2\sqrt{2}} \right]$

B. $\left[-\frac{1}{2\sqrt{2}}, -\frac{1}{2\sqrt{2}} \right]$

C. $\left[-\frac{1}{2\sqrt{2}}, \frac{1}{2\sqrt{2}} \right]$

D. $\left[\frac{1}{2\sqrt{2}}, \frac{1}{2\sqrt{2}} \right]$

Answer: C



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4. The function x and $\frac{x^2}{x}$ are identical for

A. $x \geq 0$

B. $x \leq 0$

C. $x > 0$ or $x < 0$

D. $x = 0$

Answer: C



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5. The inverse function of $\log_e x$ is

A. a) e^x

B. b) $1/x$

C. c) $\frac{1}{\log_e x}$

D. d) $\frac{x}{\log_e x}$

Answer: A



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6. If $f(x + y) = f(x) + f(y)$, then the value of $f(0)$

A. a) -1

B. b) 0

C. c) 1

D. d) None of these

Answer: B



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7. If the function $f(x)$ satisfies the condition

$$f\left(x + \frac{1}{x}\right) = x^2 + \frac{1}{x^2}, \quad x \neq 0 \text{ then } f(x) \text{ is}$$

A. a) $x^2 + 2$

B. b) $x^2 - 2$

C. c) $2 - x^2$

D. d) $\frac{x^2}{2}$

Answer: B



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8. The domain of definition of $f(x) =$

$$\sin^{-1}\left(\frac{\log_3 x}{3}\right) \text{ is}$$

A. a) $1 \leq x \leq 9$

B. b) $0 \leq x \leq 9$

C. c) $3 \leq x < 9$

D. d) $1 < x < 9$

Answer: A



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9. The domain of definition of $f(x) =$

$$\sqrt{\log_e \left(\frac{4x - x^2}{3} \right)}$$
 is

A. $0 < x < 3$

B. $x > 1$

C. $1 \leq x \leq 3$

D. $x < 3$

Answer: C



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10. The range of the function $f(x) = \sin x + \cos x$ is

A. a) $-\sqrt{2} < f(x) < \sqrt{2}$

B. b) $-\sqrt{2} \leq f(x) \leq \sqrt{2}$

C. c) $f(x) \leq \sqrt{2}$

D. d) $0 < f(x) < \sqrt{2}$

Answer: B



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11. If $f(x) = \frac{a^x + a^{-x}}{2}$, ($a > 2$) then the value of $f(x + y) + f(x - y)$ is equal to

A. a) $2f(x) \cdot f(y)$

B. b) $f(x) \cdot f(y)$

C. c) $\frac{f(x)}{f(y)}$

D. d) $f(xy)$

Answer: A



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12. If $f(x) = \frac{1}{1-x}$, then $f[f\{f(x)\}]$ is

A. a) 0

B. b) x

C. c) $-x$

D. d) $\frac{1}{1+x}$

Answer: B



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13. If $f(x) = x^2$ and $g(x) = \sqrt{x}$, then the correct relation will be

A. $g\{f(4)\} = 4$

B. $g\{f(3)\} = 6$

C. $g\{f(-2)\} = -2$

D. $g\{f(2)\} = 4$

Answer: A



14. If $f(x) = \frac{e^x - e^{-x}}{e^x + e^{-x}} + 2$, then the inverse function will be

A. $\frac{1}{2} \frac{\log_e(x - 2)}{x - 1}$

B. $\frac{1}{2} \frac{\log_e(x - 1)}{3 - x}$

C. $\frac{1}{2} \frac{\log_e x}{2 - x}$

D. $-2 \log_e \left(\frac{x - 1}{1 + x} \right)$

Answer: B



15. If $f(x + 2) = 2x^2 + 5x + 7$, then the value of $f(1)$

A. 0

B. -2

C. 2

D. 4

Answer: D



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16. The range of the function $f(x) = \frac{1}{4 + 2 \sin x}$ is

A. $(1/6, 1/2)$

B. $[1/6, 1/2)$

C. $[1/6, 1/2]$

D. $(1/6, 1/2]$

Answer: C



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17. Domain of definition of $f(x) =$

$$\sin^{-1}\left(\frac{3-2x}{5}\right)$$

A. a) $[-1,4]$

B. b) $(-1,4)$

C. c) $[0, \infty]$

D. d) $(-\infty, 4)$

Answer: A



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18. If $f(x) = \frac{Kx}{1+x}$, $x \neq -1$ and $f\{f(x)\} = x$, then the value of k

A. a) $-\sqrt{2}$

B. b) -1

C. c) 1

D. d) $\sqrt{2}$

Answer: B



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19. If $f(x) + 2f(1 - x) = x^2 + 2$, $\forall x \in \mathbb{R}$, then $f(x)$ is

A. a) $x^2 - 2$

B. b) 1

C. c) $\frac{1}{3}(x - 2)^2$

D. d) $\frac{1}{2}(x - 2)$

Answer: C



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20. Let $f : (-\infty, 1] \rightarrow (-\infty, 1]$ such that $f(x) = x(2-x)$, then $f^{-1}(x)$ is

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

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

C. $\sqrt{1-x}$

D. $\sqrt{1+x}$

Answer: B



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21. Let f be a function such that $f(x + y) = f(x) + f(y) \forall x, y \in R$, if $f(1) = k$, then show that $f(n)$ is equal to nk .



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22. f is a function such that $f(x + y) = f(x) \cdot f(y)$,

$\forall x, y \in R$, if $f(1) = 3$, then find $\sum_{r=1}^n f(r)$.



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23. Find domain of $f(x) =$

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



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24. If $f(x) = \sin x + \cos x$, $g(x) = x^2 - 1$ then

show that $g(f(x))$ is invertible in the domain

$$\left[-\frac{\pi}{4}, \frac{\pi}{4} \right].$$



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25. If $f(x) = \frac{4^x}{4^x + 2}$, then find $f(x) + f(1 - x)$.



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26. If $2f(x) - 3f(1/x) = x^2 (x \neq 0)$, then find $f(2)$.



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27. If $f(x) = \cos [\pi^2] x + \cos [- \pi^2] x$, where $[x]$ stands for the greatest integer function, then find $f\left(\frac{\pi}{2}\right), f\left(\frac{\pi}{4}\right)$.



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28. Find the range of $f(x) =$

$$\frac{x^2 + x + 2}{x^2 + x + 1} \quad (-\infty < x < \infty)$$



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29. Find the domain of definition of the

$$\text{function } f(x) = \frac{1}{\sqrt{|x| + x}}.$$



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30. If $f: \mathbb{R} \rightarrow \mathbb{R}$ such that $f(x) = x - [x]$, where $[p]$ denotes the greatest integer less than or equal to p , then find $f^{-1}(x)$, if exists.



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31. Find the range of the function

$$f(x) = x^2 + \frac{1}{x^2 + 1}.$$



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32. Find the range of the function ϕ where

$$\phi(x) = \cos^{-1}\left(\frac{x^2}{1+x^2}\right).$$



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33. Find the range of the function $f(x) =$

$$|x - 1| + |x - 2|, -1 \leq x \leq 3$$



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34. Find the range of the function

$$y = \log_3(5 + 4x - x^2).$$



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35. If $f(x + y) = f(x) - f(y), \forall x, y \in R$, then show that $f(3) = f(1)$



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36. Find the range of the function $f(x) = (e^x - e^{-x})$.



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37. Find the inverse function of the function

$$f(x) = \left[4 - (x - 7)^3 \right]^{\frac{1}{5}}.$$



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38. If $f(x) = e^{x+a}$, $g(x) = x^{b^2}$ and $h(x) = e^{b^2x}$,

then find the value of $\frac{g\{f(x)\}}{h(x)}$



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39. Find domain of the function $f(x) =$

$2^{\sin^{-1}(-1)x + 1/\sqrt{x-2}}$.



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40. Prove that the domain of $g(x) =$

$$\frac{\cot^{-1} x}{\sqrt{x^2 - [x]}}, x \in \mathbb{R} \quad \text{is}$$

$$\mathbb{R} - \{\sqrt{n} : n \geq 0, n \in \mathbb{Z}\}.$$



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41. Find the range of the function

$$y = \frac{1}{2 - \cos 2x}.$$



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42. Find the range of the function

$$y = \frac{\log_2(\sin x + \cos x + 3\sqrt{2})}{\sqrt{2}}$$



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43. Find the value of x which $f(x) = \frac{1}{\sqrt{|x| - x}}$

is not defined.



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44. Find the range of $y = \frac{x}{1 + x^2}$



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45. If $f(x) = \cos(\log_e x)$, then find the value of

$$f(x) \cdot f(y) - \frac{1}{2} \left[f\left(\frac{x}{y}\right) + f(xy) \right]$$



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46. Find the domain of

$$f(x) = \sin^{-1} \left[\log_9 \left(\frac{x^2}{4} \right) \right]$$



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47. Without using graph paper the graph of the function $y = f(x) = |x - 1| + |x + 1|$ for $-2 \leq x \leq 2$ and examine whether the function has any point of discontinuity.



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48. Without using graph paper draw a sketch graph of the function $f(x) = 2 + |x^2 - 4|$.



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49. Find the domain of the function $F(x) =$

$$\tan^{-1} \sqrt{x(x+1)} + \sin^{-1} \sqrt{x^2 + x + 1}$$



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50. Find the range of the function $f(x) =$

$$\frac{\sec^2 x - \tan x}{\sec^2 x + \tan x}, \left(-\frac{\pi}{2} < x < \frac{\pi}{2} \right).$$



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51. Find the domain of function $f(x) =$

$$\cos^{-1}\left(\frac{2 - |x|}{4}\right) + \frac{1}{\log(3 - x)} + \sqrt{x}.$$



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52. If $2f(x) + 3f(-x) = 15 - 4x$ for all real values of x , then show that $f(x) = 3 + 4x$.



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53. If $2f(x - 1) - f\left(\frac{1 - x}{x}\right) = x$ find $f(x)$.





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54. Find the inverse function of the function

$$f(x) = \left[4 - (x - 7)^3 \right]^{\frac{1}{5}}.$$



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55. If $f(n + 1) = \frac{2f(n) + 1}{2}$, $n = 1, 2, 3, \dots$

and $f(1) = 2$, then find the value of $f(101)$



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56. $f(x) = \frac{\alpha x}{x + 1}$ ($x \neq -1$), then for what value of α , $f\{f(x)\} = x$?



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57. Find the range of $f(x) = {}^{7-x}P_{x-3}$.



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58. Find the inverse function of the function

$$f(x) = 2^{x(x-1)} \quad (x > 0).$$



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59. If $f(x) = \log_e \frac{1+x}{1-x}$ and $g(x) = \frac{3x+x^3}{1+3x^2}$,

then prove that $f[g(x)] = 3 \cdot f(x)$.



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60. If $f(x) = ax^2 + bx + c$ find a, b so that $f(x+1) = f(x) + x + 1$ may hold identically.



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61. c is any real number and $c \neq 0$. Prove that

$$|f(c) - f(-c)| = 2, \text{ where } f(x) = \frac{|x|}{x}$$



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62. Find the range of $f(x) = 3 \sin \sqrt{\frac{\pi^2}{16} - x^2}$.



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63. $2f(1/x) - f(x) = 5x$, find the value of $f(x + 1/x)$.



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64. Find the Domain of definition of the function $f(x) =$

$$\sqrt{\log_{10}\left(\frac{3x - x^2}{2}\right)} + \sqrt{x - \frac{3}{2}}.$$



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65. If $g(x) = \frac{1}{x^2}$, show that $g(x) - g(x + 1) = \frac{2x + 1}{x^2(x + 1)^2}$.



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66. Find the domain of definition of the

function $f(x) =$

$$\log_{10} \log_{10} \log_{10} \{(x + 1)(x - 2)\}.$$



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