



MATHS

BOOKS - RD SHARMA MATHS (ENGLISH)

CONTINUITY

Others

1. Discuss the continuity of the function $f(x) = \begin{cases} 2x - 1, & \text{if } x < 2, \\ \frac{3x}{2}, & \text{if } x \geq 2 \end{cases}$ at $x=2$

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2. If $f(x) = \frac{2x + 3 \sin x}{3x + 2 \sin x}$, $x \neq 0$ is continuous at $x = 0$, then find $f(0)$.

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3. For what value of k is the function $f(x) = \begin{cases} \frac{x^2 - 1}{x - 1}, \\ x \neq 1, k, x = 1 \end{cases}$ continuous at $x = 1$?

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4. Find the values of a and b so that the function f given by $f(x) = \begin{cases} ax + b, & \text{if } 3 < x < 5, \\ 1, & \text{if } x \leq 3, \\ 7, & \text{if } x \geq 5 \end{cases}$ is continuous at $x = 3$ and $x = 5$.

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5. Let $f(x) = \frac{\log\left(1 + \frac{x}{a}\right) - \log\left(1 - \frac{x}{b}\right)}{x}$, $x \neq 0$. Find the value of f at $x = 0$ so that f becomes continuous at $x = 0$.

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6. If $f(x) = \begin{cases} \frac{\cos^2 x - \sin^2 x - 1}{\sqrt{x^2 + 1} - 1}, & x \neq 0, \text{ and } f(x)=k \\ , x = 0 \end{cases}$ is continuous at $x = 0$, find k

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7. Extend the definition of the following by continuity

$$f(x) = \frac{1 - \cos 7(x - \pi)}{5(x - \pi)^2} \text{ at the point } x = \pi$$

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8. Find the value of a for which the function f defined by

$$f(x) = \begin{cases} a \frac{\sin \pi}{2} (x + 1), & x \leq 0 \\ \frac{\tan x - \sin x}{x^3}, & x > 0 \end{cases} \text{ is continuous at } x=0$$

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9. Show that $f(x) = \begin{cases} 1 + x^2, & \text{if } 0 \leq x \leq 1 \\ 2-x & \text{if } x > 1 \end{cases}$ is discontinuous at $x=1$

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10. Discuss continuity of $f(x) = \begin{cases} \frac{x^2}{2} & \text{if } 0 \leq x \leq 1 \\ 2x^2 - 3x + \frac{3}{2} & \text{if } 1 < x \leq 2 \end{cases}$ at $x = 1$

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11. Examine the continuity of the function $f(x) = 3x - 2, x \leq 0$, $f(x) = x + 1, x > 0$ at $x = 0$ Also sketch the graph of this function.

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12. Discuss the continuity of the function $f(x) = x, \text{ if } x > 0, f(x) = 1, \text{ if } x = 0, f(x) = -x, x < 0$ at the point $x = 0$

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13. Discuss the continuity of the function $f(x) = \begin{cases} \frac{x}{|x|}, & x \neq 0 \\ 0, & x = 0 \end{cases}$

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14. If $f(x) = \frac{\tan\left(\frac{\pi}{4} - x\right)}{\cot 2x}$ for $x \neq \frac{\pi}{4}$, find the value which can be assigned to $f(x)$ at $x = \frac{\pi}{4}$ so that the function $f(x)$ becomes continuous everywhere in $\left[0, \frac{\pi}{2}\right]$.

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15. Determine the value of a, b, c for which the function

$$f(x) = \begin{cases} \frac{\sin(a+1)x + \sin x}{x} c \frac{\sqrt{x+bx^2} - \sqrt{x}}{bx^{\frac{3}{2}}} \end{cases},$$

$f(x) < 0$ or $x = 0$ is continuous at $x = 0$ or $x > 0$

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16. Show that $f(x) = \frac{x - |x|}{2}$, when $x \neq 0$
 $f(x) = 2$ when $x = 0$ is discontinuous at $x = 0$

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17. Find the relationship between a and b so that the function ' f ' defined by $f(x) = \begin{cases} ax + 1, & \text{if } x \leq 3 \\ bx + 3, & \text{if } x < 3 \end{cases}$ is continuous at $x = 3$.

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18. If $f(x) = \frac{\sin 3x}{x}$, when $x \neq 0$, $f(x) = 1$, when $x = 0$ Find whether $f(x)$ is continuous at $x = 0$

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19. Prove that the function $f(x) = \begin{cases} \frac{\sin x}{x}, & x < 0 \\ x + 1, & x \geq 0 \end{cases}$ is everywhere continuous.

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20. Let $f(x) = \frac{1 - \cos x}{x^2}$, when $x \neq 0$, $f(x) = 1$, when $x = 0$. Show that $f(x)$ is discontinuous at $x = 0$.

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21. If $f(x) = \begin{cases} e^{\frac{1}{x}}, & \text{if } x \neq 0 \\ 1, & \text{if } x = 0 \end{cases}$ Find whether f is continuous at $x = 0$.

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22. Test the continuity of the following function at the origin;
 $f(x) = \begin{cases} \frac{x}{|x|}, & x \neq 0 \\ 1, & x = 0 \end{cases}$



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23. The function $f(x) = \begin{cases} \frac{x^2}{a} & \text{if } 0 \leq x < 1 \\ a & \text{if } 1 \leq x < \sqrt{2} \\ \frac{2b^2 - 4b}{x^2} & \text{if } \sqrt{2} \leq x < \infty \end{cases}$ is continuous on

$[0, \infty)$. Find the most suitable values of a and b .



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24. A function $f(x)$ is defined as

$$f(x) = \begin{cases} \frac{x^2 - x - 6}{x - 3}; & \text{if } x \neq 3 \text{ and } 5 \\ 5 & \text{if } x = 3 \end{cases}$$

Show that $f(x)$ is continuous at $x = 3$.



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25. Find the domain of $f(x) = \sin^{-1} x + \cos x$



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26. If $y = (x - 1)\log(x - 1) - (x + 1)\log(x + 1)$, prove that :

$$\frac{dy}{dx} = \log\left(\frac{x - 1}{1 + x}\right)$$

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27. The value of $f(0)$, so that the function

$$f(x) = \frac{\sqrt{a^2 - ax + x^2} - \sqrt{a^2 + ax + x^2}}{\sqrt{a + x} - \sqrt{a - x}}$$
 becomes continuous for all x

, given by $a^{3/2}$ (b) $a^{1/2}$ (c) $-a^{1/2}$ (d) $-a^{3/2}$

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28. The value of a for which the function

$$f(x) = \begin{cases} 5x - 4 & \text{if } 0 < x \leq 1 \\ 4x^2 + 3ax & \text{if } 1 < x < 2 \end{cases}$$
 is continuous at every point of

its domain is

A. $\frac{13}{3}$

B. 1

C. 0

D. -1

Answer: null



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29. Evaluate : $\tan\left(\cos^{-1}\left(-\frac{7}{25}\right)\right)$



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30. The function $f(x) = \tan x$ is discontinuous on the set $\{n\pi; n \in \mathbb{Z}\}$

(b) $\{2n\pi; n \in \mathbb{Z}\}$ (c) $\{(2n+1)\frac{\pi}{2}; n \in \mathbb{Z}\}$ (d) $\{\frac{n\pi}{2}; n \in \mathbb{Z}\}$



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31. If $f(x) = |(\log)_{10}x|$, then at $x = 1$ $f(x)$ is continuous and

$f'(1^+) = (\log)_{10}e$ (b) $f(x)$ is continuous and $f'(1^+) = -(\log)_{10}e$ (c)

$f(x)$ is continuous and $f'(1^-) = (\log)_{10}e$ (d) $f(x)$ is continuous and $f'(1^+) = -(\log)_{10}e$

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32. If the function $f(x) = \begin{cases} (\cos x)^{\frac{1}{x}}, & x \neq 0 \\ k, & x = 0 \end{cases}$ is continuous at $x = 0$, then the value of k is 0 (b) 1 (c) -1 (d) e

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33. If $f(x) = (x + 1)^{\cot x}$ be continuous at $x = 0$, the $f(0)$ is equal to (a) 0 (b) $\frac{1}{e}$ (c) e (d) none of these

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34. If $f(x) = \begin{cases} mx + 1, & x \leq \frac{\pi}{2} \\ \sin x + n, & x > \frac{\pi}{2} \end{cases}$ is continuous at $x = \frac{\pi}{2}$, then

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35. If $f(x) = \begin{cases} \frac{36^x - 9^x - 4^x + 1}{\sqrt{2} - \sqrt{1 + \cos x}} & x \neq 0 \\ k & x = 0 \end{cases}$ is continuous at $x = 0$, then k

equal (A) $16\sqrt{2} \log 2 \log 3$ (B) $16\sqrt{2} \ln 6$ (C) $16\sqrt{2 \ln 2 \ln 3}$ (D) none of these



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36. If $f(x) = \begin{cases} \frac{1 - \cos 10x}{x^2 a}, & x < 0 \\ \frac{\sqrt{x}}{\sqrt{625} + \sqrt{x} - 25}, & x > 0, x = 0 \end{cases}$

then the value of a so that $f(x)$ may be continuous at $x = 0$, is 25 (b)

– 1 (c) 1 (d) indeterminate



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37. If $f(x) = \begin{cases} \frac{\sin(\cos x) - \cos x}{(\pi - 2x)^2} & x \neq \frac{\pi}{2} \\ k & x = \frac{\pi}{2} \end{cases}$ is continuous at $x = \frac{\pi}{2}$, then

k is equal to

A. (a) 0

B. (b) $\frac{1}{2}$

C. (c) 1

D. (d) -1

Answer: null

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38. Discuss the continuity of the function $f(x)$ given by

$$f(x) = \begin{cases} 2x - 1, & \text{if } x < 0 \\ 2x + 1, & \text{if } x \geq 0 \end{cases}$$

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39. The value of a for which the function

$$f(x) = \begin{cases} \frac{(4^x - 1)^3}{\sin\left(\frac{x}{a}\right) \log\left(1 + \frac{x^2}{3}\right)} & x \neq 0 \\ 12(\log 4)^3 & x = 0 \end{cases} \text{ may be continuous at } x = 0 \text{ is :}$$

A. (a) 1

B. (b) 2

C. (c) 3

D. (d) none of these

Answer: null

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40. If $f(x) = \begin{cases} ax^2 + b & 0 \leq x < 1 \\ 4 & x = 1 \\ x + 3 & 1 < x \leq 2 \end{cases}$ then the value of (a, b) for which

$f(x)$ cannot be continuous at $x = 1$, is (a)(2, 2) (b) (3, 1)(c)(4, 0) (d)
(5, 2)

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41. If $f(x) = \begin{cases} \frac{2^{x+2} - 16}{4^x - 16}, & \text{if } x \neq 2, \\ k & \text{if } x = 2 \end{cases}$ is continuous at $x = 2$,

find k

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42.

Let

$$f(x) = \begin{cases} \frac{1 - \cos 4x}{x^2 a}, & \text{if } x < 0 \\ \frac{\sqrt{x}}{\sqrt{16 + \sqrt{x}} - 4}, & \text{if } x > 0, \\ \text{if } x = 0 \end{cases}$$

Determine the value of a so that $f(x)$ is continuous at $x = 0$.

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43. if the function $f(x)$ defined by $f(x) = \frac{\log(1 + ax) - \log(1 - bx)}{x}$, if $x \neq 0$ and k if $x=0$ is continuous at $x=0$, find k .

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44. Find the value of a if the function $f(x)$ defined by

$$f(x) = \begin{cases} 2x - a, & x \leq 2 \\ x + 1, & x > 2 \end{cases} \text{ if function continuous at } x = 2$$

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45. Find the value of the constant k so that the function given below is continuous at $x = 0$.

$$f(x) = \begin{cases} \frac{1 - \cos 2x}{2x^2}, & x \neq 0 \\ k, & x = 0 \end{cases}$$

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46. Discuss the continuity of the $f(x)$ at the indicated point:

$$f(x) = |x| + |x - 1| \text{ at } x = 0, 1.$$

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47. Let $f(x + y) = f(x) + f(y)$ for all $x, y \in \mathbb{R}$. If

$f(x)$ is discontinuous at $x = 0$, show that $f(x)$ is continuous at all x .

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48. If $f(x) = \frac{\sqrt{2} \cos x - 1}{\cot x - 1}$, $x \neq \frac{\pi}{4}$. Find the value of $f\left(\frac{\pi}{4}\right)$ so that $f(x)$ becomes continuous at $x = \frac{\pi}{4}$.

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49. Determine $f(0)$ so that the function $f(x)$ defined by $f(x) = \frac{(4^x - 1)^3}{\frac{\sin x}{4} \log\left(1 + \frac{x^2}{3}\right)}$ becomes continuous at $x = 0$

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50. The function $f(x) = \begin{cases} x^2 + a, & \text{if } |x| < 2 \\ x, & \text{if } |x| = 2 \end{cases}$

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51. If $f(x) = \begin{cases} \frac{(x-4)}{(|x-4|)} + a, & \text{if } x < 4 \\ a + b, & \text{if } x = 4 \\ \frac{(x-4)}{(|x-4|)} + b, & \text{if } x > 4 \end{cases}$ is continuous at $x=4$ find a, b

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52. Prove that the function $f(x) = \begin{cases} \frac{x}{|x| + 2x^2}, & x \neq 0 \text{ and } k, \\ k, & x = 0 \end{cases}$ remains discontinuous at $x = 0$, regardless the choice of k

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53. Show that

$$f(x) = \begin{cases} \frac{\sin 3x}{\tan 2x} & \text{if } x < 0 \\ \frac{3}{2} & \text{if } x = 0 \text{ is continuous at } x = 0 \\ \frac{\log(1+3x)}{e^{2x}-1} & \text{if } x > 0 \end{cases}$$

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54. Find all point of discontinuity of the function $f(t) = \frac{1}{t^2 + t - 2}$, where $t = \frac{1}{x-1}$.

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55. Given the function $f(x) = \frac{1}{x+2}$. Find the points of discontinuity of the function $f(f(x))$

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56. If $f(x) = |x - a|\varphi(x)$, where $\varphi(x)$ is continuous function, then (a) $f'(a^+) = \varphi(a)$ (b) $f'(a^-) = -\varphi(a)$ (c) $f'(a^+) = f'(a^-)$ (d) none of these

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57. Let $f(x) = \frac{\log\left(1 + \frac{x}{a}\right) - \log\left(1 - \frac{x}{b}\right)}{x}$, $x \neq 0$. Find the value of f at $x = 0$ so that f becomes continuous at $x = 0$

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58. Let $f(x) = \frac{\tan\left(\frac{\pi}{4} - x\right)}{\cot 2x}$, $x \neq \frac{\pi}{4}$. The value which should be assigned to $f(x)$ at $x = \frac{\pi}{4}$, so that it is continuous everywhere is (a) 1 (b) $\frac{1}{2}$ (c) 2 (d) none of these

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59. The function $f(x) = \frac{x^3 + x^2 - 16x + 20}{x - 2}$ is not defined for $x = 2$. In order to make $f(x)$ continuous at $x = 2$, $f(2)$ should be defined as 0 (b) 1 (c) 2 (d) 3

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60. The value of b for which the function $f(x) = \begin{cases} 5x - 4, & 0 \leq x \leq 1, \\ 4x^2 + 3bx, & 1 < x < 2 \end{cases}$ and continuous at $x = 1$

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61. If $f(x) = \frac{1}{1-x}$, then the set of points discontinuity of the function $f(f(f(x)))$ is (a) $\{1\}$ (b) $\{0,1\}$ (c) $\{-1,1\}$ (d) none of these

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62. If the function $f(x)$ defined by $f(x) = \frac{\log(1+3x) - \log(1-2x)}{x}$, $x \neq 0$ and $k, x=0$. Find k .

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63. Show that $f(x) = 5x - 4, 0 < x < 1$ $f(x) = 4x^3 - 3x, 1 < x < 2$ continuous at $x = 1$

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64. If $f(x) = \begin{cases} a \frac{\sin \pi}{2} (x+1), & x \leq 0 \\ \frac{\tan x - \sin x}{x^3}, & x > 0 \end{cases}$ is continuous at $x = 0$, then a equal (a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{1}{4}$ (d) $\frac{1}{6}$



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65. If $f(x) = \frac{1 - \sin x}{(\pi - 2x)^2}$, when $x \neq \frac{\pi}{2}$ and $f\left(\frac{\pi}{2}\right) = \lambda$, the $f(x)$ will be continuous function at $x = \frac{\pi}{2}$, where $\lambda = ?$ (a) $\frac{1}{8}$ (b) $\frac{1}{4}$ (c) $\frac{1}{2}$ (d) none of these



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66. The value of k which makes $f(x) = \begin{cases} \frac{\sin x}{x}, & x \neq 0, \\ k, & x = 0, \end{cases}$ continuous at $x = 0$, is (a) 8 (b) 1 (c) -1 (d) none of these



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67. Show that the function $f(x) = 2x - |x|$ is continuous at $x = 0$.



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68. If the function $f(x) = \frac{2x - \sin^{-1} x}{2x + \tan^{-1} x}$ is continuous at each point of its domain, then the value of $f(0)$ (A) $\frac{4}{3}$ (B) $\frac{1}{3}$ (C) $-\frac{1}{3}$ (D) $\frac{2}{3}$

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69. Let $f(x) = \begin{cases} \frac{x-4}{|x-4|a+b} + a, & x < 0 \\ \frac{x-4}{|x-4|} + b, & x > 0 \end{cases}$ Then, $f(x)$ is continuous at $x = 4$ when (a) $a = 0, b = 0$ (b) $a = 1, b = 1$ (c) $a = -1, b = 1$ (d) $a = 1, b = -1$

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70. Let $f(x) = \begin{cases} \frac{x^4 - 5x^2 + 4}{|(x-1)(x-2)|}, & x \neq 1, 2 \end{cases}$ & 6, $x=1$ & 12, $x=2$ then $f(x)$ is continuous on the set (a) \mathbb{R} (b) $\mathbb{R} - \{1\}$ (c) $\mathbb{R} - \{2\}$ (d) $\mathbb{R} - \{1, 2\}$

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71. Let $f(x) = \begin{cases} (1+ax)^{1/x} & x < 0 \\ \frac{(x+c)^{1/3}-1}{(x+1)^{1/2}-1} & x > 0 \end{cases}$, is continuous at $x = 0$, then

$3(e^a + b + c)$ is equal to:

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72. Determine the value of the constant m so that the function $f(x) = \begin{cases} m(x^2 - 2x), & \text{if } x < 0 \\ \cos x, & \text{if } x \geq 0 \end{cases}$ is continuous.

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73. The value of $f(0)$, so that the function

$f(x) = \frac{(27-2x)^{\frac{1}{3}} - 3}{9 - 3(243+5x)^{1/5}} (x \neq 0)$ is continuous, is given by (a) $\frac{2}{3}$ (b)

6 (c) 2 (d) 4

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74. The function $f(x) = \begin{cases} e^{\frac{1}{x}} - 1, & x \neq 0 \\ e^{\frac{1}{x}} + 1, & x = 0 \end{cases}$ (a) is continuous at $x = 0$ (b) is not continuous at $x = 0$ (c) is not continuous at $x = 0$, but can be made continuous at $x = 0$ (d) none of these

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75. The points of discontinuity of the function $f(x) = \begin{cases} 2\sqrt{x}, & 0 \leq x < 1 \\ 4 - 2x, & 1 < x \end{cases}$

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76. If $f(x) = \frac{\tan\left(\frac{\pi}{4} - x\right)}{\cot 2x}$ for $x \neq \frac{\pi}{4}$, find the value of which can be assigned to $f(x)$ at $x = \frac{\pi}{4}$ so that the function $f(x)$ becomes continuous every where in $\left[0, \frac{\pi}{2}\right]$

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77. Find the values of a and b so that the function $f(x)$ defined by $f(x) = \{(x^2 + ax + b), (0 \leq x < 2), (3x + 2), (2 \leq x \leq 4), (2a - x + 5b), (4 < x \leq 8)\}$ becomes continuous on $[0, \pi]$.



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78. $f(x) = \begin{cases} \frac{\sqrt{1+px} - \sqrt{1-px}}{x}, & -1 \leq x < 0 \\ \frac{2x+1}{x-2}, & 0 \leq x \leq 1 \end{cases}$ is

continuous in the interval $[-1, 1]$, then p is equal to -1 (b) $-\frac{1}{2}$ (c) $\frac{1}{2}$

(d) 1



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79. The value of $f(0)$ so that the function

$$f(x) = \frac{2 - (256 - 7x)^{\frac{1}{8}}}{(5x + 32)^{\frac{1}{5}} - 2}, x \neq 0$$

is continuous everywhere, is given by

A. (a) -1

B. (b) 1

C. (c) 26

D. (d) none of these

Answer: null

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80. Find k if the function $f(x) = \begin{cases} \frac{\sin 3x}{x}, & x \neq 0; \\ \frac{k}{2}, & x = 0 \end{cases}$ is continuous at $x=0$. (a) 3 (b) 6 (c) 9 (d) 12

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81. Discuss the continuity of the function $f(x) = \begin{cases} \frac{\sin 2x}{x}, & \text{if } x < 0, \\ x + 2, & \text{if } x \geq 0 \end{cases}$

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82. Test the continuity of the following function at the origin:

$$f(x) = \begin{cases} \frac{|x|}{x}; & x \neq 0 \\ 1; & x = 0 \end{cases}$$

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83. Show that the function $f(x)$ given by $f(x) = \begin{cases} x \sin\left(\frac{1}{x}\right) & x \neq 0 \\ 0 & x = 0 \end{cases}$ is

continuous at $x = 0$

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84. Show that the function $f(x)$ given by

$$f(x) = \begin{cases} \frac{\sin x}{x} + \cos x, & x \neq 0 \\ 2, & x = 0 \end{cases}$$
 is continuous at $x = 0$.

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85. Examine the function $f(x)$ given by $f(x) = \begin{cases} \frac{\cos x}{\frac{\pi}{2} - x} & x \neq \frac{\pi}{2} \\ 1 & x = \frac{\pi}{2} \end{cases}$;
for continuity at $x = \frac{\pi}{2}$

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86. Discuss the continuity of the function $f(x)$ given by
 $f(x) = \begin{cases} 2 - x & x < 0 \\ 2 + x & x \geq 0 \end{cases}$ at $x = 0$

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87. Determine the values of a, b, c for which the function

$$f(x) = \begin{cases} \frac{\sin(a+1)x + \sin x}{x} & x < 0 \\ c & x = 0 \\ \frac{\sqrt{x+bx^2} - \sqrt{x}}{bx^{\frac{3}{2}}} & x > 0 \end{cases} \text{ is continuous at } x = 0$$

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88. If $f(x) = \begin{cases} \frac{1 - \cos kx}{x \sin x} & x \neq 0 \\ \frac{1}{2} & x = 0 \end{cases}$ is continuous at $x=0$, find k

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89. Discuss the continuity of the function of given by $f(x) = |x - 1| + |x - 2|$ at $x = 1$ and $x = 2$

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90. Determine the value of k for which the following function is continuous at $x = 3$. $f(x) = \begin{cases} \frac{x^2 - 9}{x - 3}, & x \neq 3 \\ k & x = 3 \end{cases}$

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91. Let $f(x) = |x| + |x - 1|$, then

A. (a) $f(x)$ is continuous at $x = 0$, as well at $x = 1$

B. (b) $f(x)$ is continuous at $x = 0$, but not at $x = 1$

C. (c) $f(x)$ is continuous at $x = 1$, but not at $x = 0$

D. (d) none of these

Answer: null

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92. The function $f(x) = \frac{4 - x^2}{4x - x^3}$ a) discontinuous at only one point b) discontinuous exactly at two points c) discontinuous exactly at three points d) none of these

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93. If $f(x)$ defined by $f(x) = \begin{cases} |x^2 - x| \\ x^2 - |x| \end{cases}, x \neq 0, 1 - 1$. Then (A) $f(x)$ is continuous for all x (B) for all x except $x = 0$ (C) for all x except $x = 1$ (D) for all x except $x = 0$ and $x = 1$

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94. Discuss the continuity of the $f(x)$ at the indicated points:

$f(x) = |x| + |x - 1|$ at $x = 0, 1$ $f(x) = |x - 1| + |x + 1|$ at $x = -1, 1$

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95. Prove that $f(x) = \sqrt{|x| - x}$ is continuous for all $x \geq 0$.

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96. Given $f(x) = \frac{1}{x - 1}$. Find the points of discontinuity of the composite function $f(f(x))$.

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97. Test the continuity of the following function at the origin:

$$f(x) = \begin{cases} \frac{|x|}{x}; & x \neq 0 \\ 1; & x = 0 \end{cases}$$

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98. Show that the function $f(x)$ given by

$$f(x) = \begin{cases} x \frac{\sin 1}{x}, & x \neq 0 \\ 0, & x = 0 \end{cases}$$

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99. Show that the function $f(x)$ given by

$$f(x) = \begin{cases} \frac{\sin x}{x} + \cos x, & x \neq 0 \\ 2, & x = 0 \end{cases}$$

is continuous at $x = 0$.

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100. Examine the function $f(t)$ given by

$$f(t) = \begin{cases} \frac{\cos t}{\pi/2 - t}; & t \neq \pi/2; \\ 1 & \text{at } t = \pi/2 \end{cases} \text{ for continuity at } t = \pi/2.$$



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101. Show that the function $f(x)$ given by $f(x) = \begin{cases} \frac{e^{\frac{1}{x}} - 1}{e^{\frac{1}{x}} + 1} & \text{when } x \neq 0 \\ 0 & \text{when } x = 0 \end{cases}$

is discontinuous at $x = 0$.



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102. Discuss the continuity of the function $f(x)$ at $x = 1/2$, where

$$f(x) = \begin{cases} \frac{1}{2-x} & 0 \leq x < \frac{1}{2} \\ 1 & x = \frac{1}{2} \\ \frac{3}{2-x} & \frac{1}{2} < x \leq 1 \end{cases}$$



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103. Discuss the continuity of the function $f(x)$ given by

$$f(x) = \begin{cases} 2 - x; & x < 2 \\ 2 + x; & x \geq 2 \end{cases} \text{ at } x = 2.$$



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104. Show that $f(x) = \begin{cases} 5x - 4, & \text{when } 0 < x \leq 1, \\ 4x^3 - 3x, & \text{when} \end{cases}$

$1 < x < 2$ is continuous at $x = 1$.



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105. Show that the function $f(x) = 2x - |x|$ is continuous at $x = 0$.



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106. Discuss the continuity of the function of given by

$$f(x) = |x - 1| + |x - 2| \text{ at } x = 1 \text{ and } x = 2.$$



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107. Determine the value of k for which the following function is continuous at $x = 3$. $f(x) = \begin{cases} \frac{x^2 - 9}{x - 3}, & x \neq 3, \\ f(x) = k, & x = 3 \end{cases}$

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108. Find the value of the constant λ so that the function given below is continuous at $x = -1$

$$f(x) = \begin{cases} \frac{x^2 - 2x - 3}{x + 1}, & x \neq -1 \\ \lambda, & x = -1 \end{cases}$$

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109. Find the value of $f(0)$ so that the function given below is continuous at $x = 0$ $f(x) = \frac{1 - \cos 2x}{2x^2}$

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110. Find the value of 'a' if the function $f(x)$ defined by $f(x) = \begin{cases} 2x - 1, & x < 2 \\ a, & x = 2 \\ 2x + 1, & x > 2 \end{cases}$ is continuous at $x = 2$



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111. If the function $f(x)$ defined by $f(x) = \begin{cases} \frac{\log(1+ax) - \log(1-bx)}{x}, & \text{if } x \neq 0 \\ k, & \text{if } x = 0 \end{cases}$ is continuous at $x = 0$, find k .



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112. Find the values of 'a' so that the function $f(x)$ defined by $f(x) = \begin{cases} \frac{\sin^2 ax}{x^2}, & x \neq 0 \\ 1, & x = 0 \end{cases}$ may be continuous at $x = 0$.



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113. If the function $f(x)$ given by

$$f(x) = \begin{cases} 3ax + b, & \text{if } x > 1 \\ 11, & \text{if } x = 1 \\ 5ax - 2b, & \text{if } x < 1 \end{cases}$$

is continuous at $x = 1$, find the values of a and b .

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114. Let

$$f(x) = \begin{cases} \frac{1 - \cos 4x}{x^2}, & \text{if } x < 0 \\ a, & \text{if } x = 0 \\ \frac{\sqrt{x}}{\sqrt{16 + \sqrt{x}} - 4}, & \text{if } x > 0 \end{cases}$$

Determine the value of a so that $f(x)$ is continuous at $x = 0$.

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115. Determine $f(0)$ so that the function $f(x)$ defined by

$$f(x) = \frac{(4^x - 1)^3}{\frac{\sin x}{4} \log\left(1 + \frac{x^2}{3}\right)}$$
 becomes continuous at $x = 0$

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116. If $f(x) = \frac{\sqrt{2} \cos x - 1}{\cot x - 1}$, $x \neq \frac{\pi}{4}$. Find the value of $f\left(\frac{\pi}{4}\right)$ so that $f(x)$ becomes continuous at $x = \pi/4$.



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117. Prove that the greatest integer function $[x]$ is continuous at all points except at integer points.



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118. Let $f(x + y) = f(x) + f(y)$ for all $x, y \in \mathbb{R}$, if $f(x)$ is discontinuous at $x = 0$, show that $f(x)$ is continuous at all x .



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119. Show that the function $f(x) = |\sin x + \cos x|$ is continuous at $x = \pi$.



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120. Does there exist a value of $f(0)$ such that the following function

$$\text{becomes continuous at the origin } f(x) = \begin{cases} \frac{x}{|x|}, & x \neq 0 \end{cases}$$

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121. A function $f(x)$ is defined as

$$f(x) = \begin{cases} \frac{x^2 - x - 6}{x - 3}; & \text{if } x \neq 3 \\ 5; & \text{if } x = 3 \end{cases} \text{ Show that}$$

$f(x)$ is continuous at $x = 3$.

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122. A function $f(x)$ is defined as

$$f(x) = \begin{cases} \frac{x^2 - 9}{x - 3}; & \text{if } x \neq 3 \\ 6; & \text{if } x = 3 \end{cases} \text{ Show that } f(x) \text{ is}$$

continuous at $x = 3$.

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123. If $f(x) = \begin{cases} \frac{x^2 - 1}{x - 1}; & \text{for } x \neq 1; \\ 2 & \text{for } x = 1. \end{cases}$ Find whether $f(x)$ is continuous at $x = 1$.

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124. If $f(x) = \begin{cases} \frac{\sin 3x}{x}, & \text{when } x \neq 0 \\ 1, & \text{when } x = 0 \end{cases}$. Find whether $f(x)$ is continuous at $x = 0$.

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125. If $f(x) = \begin{cases} e^{1/x}, & \text{if } x \neq 0 \\ 1, & \text{if } x = 0 \end{cases}$. Find whether f is continuous at $x = 0$

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126. Let $f(x) = \begin{cases} \frac{1 - \cos x}{x^2}, & \text{when } x \neq 0 \\ 1, & \text{when } x = 0 \end{cases}$. Show that $f(x)$ is discontinuous at $x = 0$.



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127. Show that $f(x) = \begin{cases} \frac{x - |x|}{2}, & \text{when } x \neq 0 \\ 2, & \text{when } x = 0 \end{cases}$ is discontinuous at $x = 0$.



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128. Show that $f(x) = \begin{cases} \frac{|x - a|}{x - a}, & \text{when } x \neq a \end{cases}$

is discontinuous at $x = a$ for any value of $f(a)$



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129. Discuss the continuity of $f(x) = \begin{cases} |x| \cos\left(\frac{1}{x}\right), & x \neq 0 \\ 0, & x = 0 \end{cases}$ at $x = 0$



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130. Discuss the differentiability of $f(x) = \begin{cases} x^2 \sin\left(\frac{1}{x}\right), & x \neq 0; \\ 0 & \text{if } x=0 \end{cases}$ at $x = 0$

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131. Discuss the continuity of $f(x) = \begin{cases} (x - a)\sin\left(\frac{1}{x - a}\right), & x \neq a \\ 0, & x = a \end{cases}$ at $x = a$

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132. $f(x) = \begin{cases} \frac{e^x - 1}{\log(1 + 2x)}, & \text{if } x \neq 0 \\ 7, & \text{if } x = 0 \end{cases}$ at $x = 0$

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133. $f(x) = \begin{cases} \frac{1 - x^n}{1 - x}, & (x \neq 1, n \in \mathbb{N}) \\ n, & \text{at } x = 1 \end{cases}$

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$$134. f(x) = \begin{cases} \frac{|x^2 - 1|}{x - 1}, & \text{for } x \neq 1 \\ 2, & \text{for } x = 1 \end{cases} \text{ at } x = 1$$

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$$135. f(x) = \begin{cases} \frac{2|x| + x^2}{x}, & x \neq 0, \\ 0 & \text{at } x = 0 \end{cases} \text{ is continuous at } x = 0 \text{ or not.}$$

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$$136. f(x) = \begin{cases} |x - a| \sin\left(\frac{1}{x - a}\right), & \text{for } x \neq a, \\ 0 & \text{if } x = a \end{cases} \text{ at } x = a$$

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137. Show that $f(x) = \begin{cases} 1 + x^2, & \text{if } 0 \leq x \leq 1, \\ 2 - x, & \text{if } x > 1 \end{cases}$ is discontinuous at $x = 1$.

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138. Show that $f(x) = \begin{cases} \frac{\sin 3x}{\tan 2x}, & \text{if } x < 0, \\ \frac{3}{2}, & \text{if } x = 0, \\ \frac{\log(1 + 3x)}{e^{2x} - 1}, & \text{if } x > 0 \end{cases}$ is continuous at $x = 0$.

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139. Find the value of ' a ' for which the function f defined by $f(x) = \begin{cases} a \frac{\sin \pi}{2}(x + 1), & x \leq 0 \\ \frac{\tan x - \sin x}{x^3}, & x > 0 \end{cases}$ is continuous at $x = 0$.

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140. Examine the continuity of the function

$f(x) = \begin{cases} 3x - 2, & x \leq 0 \\ x + 1, & x > 0 \end{cases}$ at $x = 0$. Also sketch the graph of this function.

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141. Discuss the continuity of the function

$f(x) = \begin{cases} x, & x > 0 \\ 1, & x = 0 \\ -x, & x < 0 \end{cases}$ at the point $x = 0$.

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142. Discuss the continuity of the function $f(x) = \begin{cases} x & 0 \leq x < \frac{1}{2} \\ 12 & x = \frac{1}{2} \\ 1 - x & \frac{1}{2} < x \leq 1 \end{cases}$ at

the point $x = 1/2$.

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143. Discuss the continuity of $f(x) = \begin{cases} 2x - 1, & x < 0; \\ 2x + 1, & x \geq 0 \end{cases}$ at $x = 0$

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144. For what value of k is the function $f(x) = \begin{cases} \frac{x^2 - 1}{x - 1}, & x \neq 1 \\ k, & x = 1 \end{cases}$ continuous at $x = 1$?

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145. Determine the value of the constant k so that the function $f(x) = \begin{cases} \frac{x^2 - 3x + 2}{x - 1}, & \text{if } x \neq 1 \\ k, & \text{if } x = 1 \end{cases}$ is continuous at $x = 1$.

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146. For what value of k is the function $f(x) = \begin{cases} \frac{\sin 5x}{3x}, & \text{if } x \neq 0, \\ k, & \text{if } x = 0 \end{cases}$ continuous at $x = 0$?

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147. Determine the value of the constant k so that the function $f(x) = \begin{cases} kx^2, & \text{if } x \leq 2, \\ k, & \text{if } x > 2 \end{cases}$ is continuous at $x = 2$.

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148. Determine the value of the constant k so that the function $f(x) = \begin{cases} \frac{\sin 2x}{5x}, & \text{if } x \neq 0, \\ k, & \text{if } x = 0 \end{cases}$ is continuous at $x = 0$.

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149. Find the values of a so that the function

$$f(x) = \begin{cases} ax + 5, & \text{if } x \leq 2 \end{cases}$$

$$x - 1, \quad \text{if } x > 2$$

is continuous at $x=2$

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150. Prove that the function $f(x) = \begin{cases} \frac{x}{|x| + 2x^2}, & x \neq 0 \\ k, & x = 0 \end{cases}$

remains discontinuous at $x = 0$, regardless the choice of k .

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151. Find the value of k if $f(x)$ is continuous at $x = \frac{\pi}{2}$, where

$$f(x) = \begin{cases} \frac{k \cos x}{\pi - 2x}, & x \neq \frac{\pi}{2} \\ 3, & x = \frac{\pi}{2} \end{cases}$$

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152. Determine the values of a, b, c for which the function

$$f(x) = \begin{cases} \frac{\sin(a+1)x + \sin x}{x}, & \text{for } x < 0 \\ c, & \text{for } x = 0 \\ \frac{\sqrt{x+bx^2}}{bx^{3/2}}, & \text{for } x > 0 \end{cases}$$

is continuous at $x = 0$

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153. If $f(x) = \begin{cases} \frac{1 - \cos kx}{x \sin x}, & x \neq 0 \\ \frac{1}{2}, & x = 0 \end{cases}$ is continuous at $x=0$,

find k .

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154. If

$$f(x) = \begin{cases} \frac{x-4}{|x-4|} + a, & \text{if } x < 4, \\ a+b & \text{if } x = 4, \\ \frac{x-4}{|x-4|} + b, & \text{if } x > 4 \end{cases}$$

is continuous at $x = 4$, find a, b .

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155. For what value of k is the function

$$f(x) = \begin{cases} \frac{\sin 2x}{x}, & x \neq 0 \\ k, & x = 0 \end{cases} \text{ continuous at } x = 0?$$

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156. Let $f(x) = \frac{\log\left(1 + \frac{x}{a}\right) - \log\left(1 - \frac{x}{b}\right)}{x}$, $x \neq 0$. Find the value of f at $x = 0$ so that f becomes continuous at $x = 0$.

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157. If $f(x) = \begin{cases} \frac{2^{x+2} - 16}{4^x - 16} & x \neq 2 \\ k & x = 2 \end{cases}$ is continuous at $x = 2$, find k .

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158. If $f(x) = \begin{cases} \frac{\cos^2 x - \sin^2 x - 1}{\sqrt{x^2 + 1} - 1}, & x \neq 0 \\ k, & x = 0 \end{cases}$ is continuous at $x = 0$, find k .

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159. Extend the definition of the following by continuity

$$f(x) = \frac{1 - \cos 7(x - \pi)}{5(x - \pi)^2} \text{ at the point } x = \pi.$$

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160. If $f(x) = \frac{2x + 3 \sin x}{3x + 2 \sin x}$, $x \neq 0$ is continuous at $x = 0$, then find $f(0)$

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161. Find the values of k for which

$f(x) = \begin{cases} \frac{1 - \cos 4x}{8x^2}, & \text{when } x \neq 0 \\ k, & \text{when } x = 0 \end{cases}$ is continuous at $x = 0$.

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162. Find the value of the constant k so that the given function is

continuous at the indicated point: $f(x) = \begin{cases} \frac{1 - \cos 2kx}{x^2} & \text{if } x \neq 0 \\ 8 & \text{if } x = 0 \end{cases}$ at

$$x = 0$$



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163. Find the value of the constant k so that the given function is

continuous at the indicated point:

$$f(x) = \begin{cases} (x - 1)\tan\left(\frac{\pi x}{2}\right) & \text{if } x \neq 1 \\ k & \text{if } x = 1 \end{cases} \text{ at } x = 1$$



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164. Find the value of the constant k so that the given function is

continuous at the indicated point:

$$f(x) = \begin{cases} k(x^2 - 2x), & \text{if } x < 0 \\ \cos x, & \text{if } x \geq 0 \end{cases} \text{ at } x = 0$$



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165. Find the value of the constant k so that the given function is continuous at the indicated point:

$$f(x) = \begin{cases} kx + 1, & \text{if } x \leq \pi \\ \cos x, & \text{if } x > \pi \end{cases} \text{ at } x = \pi$$



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166. Find the value of the constant k so that the given function is continuous at the indicated point:

$$f(x) = \begin{cases} kx + 1, & \text{if } x \leq 5 \\ 3x - 5, & \text{if } x > 5 \end{cases} \text{ at } x = 5$$



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167. Find the value of the constant k so that the given function is

continuous at the indicated point: $f(x) = \begin{cases} x^2 - 25, & x \neq 5 \\ k, & x = 5 \end{cases}$

at $x = 5$



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168. Find the value of the constant k so that the given function is continuous at the indicated point: $f(x) = \begin{cases} kx^2, & x \geq 14 \\ x < 1 \end{cases}$ at $x = 1$

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169. Find the value of the constant k so that the given function is continuous at the indicated point:

$$f(x) = \begin{cases} k(x^2 + 2), & \text{if } x \leq 0 \\ 3x + 1, & \text{if } x > 0 \end{cases} \text{ at } x = 0.$$

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170. Find the value of the constant k so that the given function is continuous at the indicated point:

$$f(x) = \begin{cases} \frac{x^3 + x^2 - 16x + 20}{(x - 2)^2}, & x \neq 2 \\ k, & x = 2 \end{cases} \text{ at } x = 0.$$

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171. Find the values of a and b so that the function f given by $f(x)=\begin{cases} 1, & \text{if } x \leq 3, \\ ax+b, & \text{if } 3 < x < 5, \\ 7, & \text{if } x \geq 5 \end{cases}$ is continuous at $x=3$ and $x=5$.

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172. If $f(x) = \begin{cases} \frac{x^2}{2}, & \text{if } 0 \leq x < 1, \\ 2x^2 - 3x + \frac{3}{2}, & \text{if } 1 \leq x \leq 2 \end{cases}$

Show that f is continuous at $x = 1$.

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173. Discuss the continuity of the $f(x)$ at the indicated point:

$f(x) = |x| + |x - 1|$ at $x = 0, 1$.

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174. Discuss the continuity of the $f(x)$ at the indicated point:

$f(x) = |x - 1| + |x + 1|$ at $x = -1, 1$.

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175. Prove that $f(x) = \begin{cases} \frac{x-|x|}{x} & x \neq 0 \\ 2 & x = 0 \end{cases}$ is discontinuous at $x = 0$.

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176. If $f(x) = \begin{cases} 2x^2 + k & , \quad \text{if } x \geq 0 \\ -2x^2 + k & , \quad \text{if } x < 0 \end{cases}$, then what should be the value of k so that $f(x)$ is continuous at $x = 0$.

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177. For what value of λ is the function $f(x) = \begin{cases} \lambda(x^2 - 2x) & , \quad \text{if } x \leq 0 \\ 4x + 1 & , \quad \text{if } x > 0 \end{cases}$ continuous at $x = 0$? What about the continuity at $x = \pm 1$?

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178. For what value of k is the following function continuous at $x = 2$?

$$f(x) = \begin{cases} 2x + 1 & ; \quad \text{if } x < 2 \end{cases}$$

$$k \quad ; \quad x = 2$$

$$3x - 1 \quad ; \quad x > 2$$

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179. Let $f(x) = \begin{cases} \frac{1 - \sin^3 x}{3 \cos^2 x} & \text{if } x < \frac{\pi}{2}, a & \text{if } x = \frac{\pi}{2} \end{cases}$. If $f(x)$ is continuous at $x = \frac{\pi}{2}$ b(1-sinx)/(pi-2x)^2, if x>pi/2 find a and b .

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180. If the functions $f(x)$, defined below is continuous at $x = 0$, find the value of k :

$$f(x) = \begin{cases} \frac{1 - \cos 2x}{2x^2} & , \quad x < 0 \\ k, & x = 0, \\ \frac{x}{|x|} & , \quad x > 0 \end{cases}$$

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181. Find the relationship between 'a' and 'b' so that the function 'f' defined by $f(x) = \begin{cases} ax + 1, & \text{if } x \leq 3 \\ 3bx + 3, & \text{if } x > 3 \end{cases}$ is continuous at $x = 3$.

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182. If a function f is defined as $f(x) = \begin{cases} |x - 4|, & x \neq 4 \\ 0, & x = 4 \end{cases}$

Show that f is everywhere continuous except at $x = 4$.

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183. Discuss the continuity of the function

$$f(x) = \begin{cases} \frac{\sin 2x}{x}, & \text{if } x < 0 \\ 0x + 2, & \text{if } x \geq 0 \end{cases}$$

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184. Discuss the continuity of the function

$$f(x) = \begin{cases} \frac{|x|}{x} & , \quad \text{if } x \neq 0 \\ 0 & , \quad \text{if } x = 0. \end{cases}$$

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185. Discuss the continuity of the function $f(x)$ given by

$$f(x) = \begin{cases} 2x - 1, & \text{if } x < 0 \\ 2x + 1, & \text{if } x \geq 0 \end{cases}$$

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186. Show that the function f defined by $f(x) = |1 - x + |x||$ is everywhere continuous.

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187. Prove that $f(x) = \sqrt{|x| - x}$ is continuous for all $x \geq 0$.

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188. Given $f(x) = \frac{1}{x-1}$. Find the points of discontinuity of the composite function $f(f(x))$.

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189. Determine the value of the constant k so that the function $f(x) = \begin{cases} kx^2, & \text{if } x \leq 23 \\ \text{if } x > 2 \end{cases}$ is continuous.

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190. Determine the value of the constant m so that the function $f(x) = \begin{cases} m(x^2 - 2x) & \text{if } x < 0, \\ \cos x & \text{if } x \geq 0 \end{cases}$ is continuous.

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191. If

$f(x) = \begin{cases} 3ax + b & \text{if } x > 1, \\ 11 & \text{if } x = 1, \\ 5ax - 2b, & \text{if } x < 1. \end{cases}$ Determine

a and b so that $f(x)$ is continuous.

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192. Prove that the function

$f(x) = \begin{cases} \frac{\sin x}{x} & , \quad x < 0 \\ x + 1 & , \quad x \geq 0 \end{cases}$ is everywhere continuous.

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193. Discuss the continuity of the function

$f(x) = \begin{cases} \frac{x}{|x|} & , \quad x \neq 0 \\ 0 & , \quad x = 0. \end{cases}$

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194. Find the points of discontinuity, if any, of the following function:

$$f(x) = \begin{cases} [x^3 - x^2 + 2x - 2] , & \text{if } x \neq 1 \\ 4 & \text{if } x = 1 \end{cases}$$



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195. Find the points of discontinuity, if any, of the following function:

$$f(x) = \begin{cases} \frac{x^4 - 16}{x - 2} , & \text{if } x \neq 2 \\ 16 , & \text{if } x = 2 \end{cases}$$



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196. Find the points of discontinuity, if any, of the following function:

$$f(x) = \begin{cases} \frac{\sin x}{x} , & \text{if } x < 0 \\ 2x + 3 , & \text{if } x \geq 0 \end{cases}$$



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197. Find the points of discontinuity, if any, of the following function:

$$f(x) = \begin{cases} \frac{\sin 3x}{x} , & \text{if } x \neq 0 \\ 0 , & \text{if } x = 0 \end{cases}$$



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198. Find the points of discontinuity, if any, of the following function:

$$f(x) = \begin{cases} \frac{\sin x}{x} + \cos x & , \quad \text{if } x \neq 0 \\ k & , \quad \text{if } x = 0 \end{cases}$$



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199. Find the points of discontinuity, if any, of the following function:

$$f(x) = \begin{cases} \frac{x^4 + x^3 + 2x^2}{\tan^{-1}x} & , \quad \text{if } x \neq 0 \\ 0 & , \quad \text{if } x = 0 \end{cases}$$



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200. Find the points of discontinuity, if any, of the following function:

$$f(x) = \begin{cases} \frac{e^x - 1}{(\log)_e(1 + 2x)} & , \quad \text{if } x \neq 0 \\ 7 & , \quad \text{if } x = 0 \end{cases}$$



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201. Find the points of discontinuity, if any, of the following function:

$$f(x) = \begin{cases} |x - 3|, & \text{if } x \geq 1 \\ \frac{x^2}{4} - \frac{3x}{2} + \frac{13}{4}, & \text{if } x < 1 \end{cases}$$

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202. Find the points of discontinuity, if any, of the following function:

$$f(x) = \begin{cases} |x| + 3 & \text{if } x \leq -3 \\ -2x, & \text{if } -3 < x < 3 \\ 6x + 2, & \text{if } x > 3 \end{cases}$$

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203. Find the points of discontinuity, if any, of the following function:

$$f(x) = \begin{cases} x^{10} - 1, & \text{if } x \leq 1 \\ x^2, & \text{if } x > 1 \end{cases}$$

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204. Find the points of discontinuity, if any, of the following function:

$$f(x) = \begin{cases} 2x, & \text{if } x < 0 \\ 0, & \text{if } 0 \leq x \leq 1 \\ 4x, & \text{if } x > 1 \end{cases}$$

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205. Find the points of discontinuity, if any, of the following function:

$$f(x) = \begin{cases} \sin x - \cos x & , \quad \text{if } x \neq 0 \\ -1 & , \quad \text{if } x = 0 \end{cases}$$

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206. Find the points of discontinuity, if any, of the following function:

$$f(x) = \begin{cases} -2 & \text{if } x \leq -1, \\ 2x & \text{if } -1 < x < 1, \\ 2 & \text{if } x \geq 1 \end{cases}$$

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207. Determine the value(s) of constant(s) involved in the definition so

that the given function is continuous:

$$f(x) = \begin{cases} \frac{\sin 2x}{5x} & , \quad \text{if } x \neq 0 \\ 3k & , \quad \text{if } x = 0 \end{cases}$$

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208. Determine the value(s) of constant(s) involved in the definition so that the given function is continuous:

$$f(x) = \begin{cases} kx + 5, & \text{if } x \leq 2 \\ x - 1, & \text{if } x > 2 \end{cases}$$

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209. Determine the value(s) of constant(s) involved in the definition so that the given function is continuous:

$$f(x) = \begin{cases} k(x^2 + 3), & \text{if } x < 0 \\ \cos 2x, & \text{if } x \geq 0 \end{cases}$$

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210. Determine the value(s) of constant(s) involved in the definition so that the given function is continuous:

$$f(x) = \begin{cases} 2, & \text{if } x \leq 3 \\ ax + b, & \text{if } 3 < x < 5 \\ 9, & \text{if } x \geq 5 \end{cases}$$

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211. Determine the value(s) of constant(s) involved in the definition so that the given function is continuous:

$$f(x) = \begin{cases} 4, & \text{if } x \leq -1, \\ ax^2 + b, & \text{if } x > -1 \end{cases}$$

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212. Find the value of k , for which

$$f(x) = \begin{cases} \frac{\sqrt{1+kx} - \sqrt{1-kx}}{x} & \text{if } -1 \leq x < 0 \\ \frac{2x+1}{x-1} & 0 \leq x < 1 \end{cases} \text{ is continuous at } x = 0$$

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213. Determine the equation so that the given function is continuous:

$$f(x) = \begin{cases} 5 & \text{if } x \leq 2, \\ ax+b, & \text{if } x > 2 \end{cases}$$

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214. Find the value of k so that the function f defined by

$$f(x) = \begin{cases} \frac{k \cos x}{\pi - 2x}, & \text{if } x \neq \frac{\pi}{2} \\ 3, & \text{if } x = \frac{\pi}{2} \end{cases} \text{ is continuous at } x = \frac{\pi}{2}$$



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215. The function

$$f(x) = \begin{cases} \frac{x^2}{a}, & \text{if } 0 \leq x < 1 \\ a, & \text{if } 1 \leq x \end{cases} \text{ is continuous}$$

then find the value of constant term



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216.

$$f(x) = \begin{cases} x + \sqrt{2}a \sin x, & 0 < x < \frac{\pi}{4} \\ 2x \cot x + b, & \frac{\pi}{4} \leq x < \frac{\pi}{2} \end{cases} \text{ and } c$$

. Determine the value of a and b if function is continuous for interval

$$[0, \pi]$$



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217. The function $f(x)$ is defined by

$$f(x) = \begin{cases} x^2 + ax + b, & 0 \leq x < 2, \\ 3x + 2, & 2 \leq x \leq 4, \\ 2ax + 5b \end{cases}$$

If f is continuous then determine the value of a and b

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218. If $f(x) = \frac{\tan\left(\frac{\pi}{4} - x\right)}{\cot 2x}$ for $x \neq \frac{\pi}{4}$, find the value which can be assigned to $f(x)$ at $x = \frac{\pi}{4}$ so that the function $f(x)$ becomes continuous everywhere in $\left[0, \frac{\pi}{2}\right]$.

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219. Discuss the continuity of the function $f(x) = \begin{cases} 2x - 1, & \text{if } x < 2, \\ \frac{3x}{2}, & \text{if } x \geq 2 \end{cases}$

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220. Find $\frac{dy}{dx}$ if $y = x - y - 2x^2$.

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221. Prove that the function $f(x) = \begin{cases} \frac{\sin x}{x} & , \quad x < 0, \\ x + 1 & , \quad x \geq 0 \end{cases}$ is everywhere continuous.

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222. Show that the function defined by $g(x) = x - [x]$ is discontinuous at all integral points. which $[x]$ denotes the greatest integer function.

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223. Find the derivative if $f(x) = \sin x + \cos x$

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224. Find the derivative of $f(x) = \sin x - \cos x$

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225. Find $f'(x)$ if $f(x) = \sin x \cos x$

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226. Find $f'(x)$ if $f(x) = \cos(x^2)$

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227. Find $\frac{dy}{dx}$ if $x + x^7 = 2y$

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228. Find all the points of discontinuity of f defined by

$$f(x) = |x| - |x+1|.$$



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229. Determine if f defined by

$$f(x) = \begin{cases} x^2 \sin\left(\frac{1}{x}\right), & \text{if } x \neq 0, \\ 0 & \text{if } x = 0 \end{cases}$$
 is a continuous

function?



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230. Given the function $f(x) = \frac{1}{x+2}$. Find the points of discontinuity

of the function $f(f(x))$



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231. Find all point of discontinuity of the function $f(t) = \frac{1}{t^2 + t - 2}$, where $t = \frac{1}{x - 1}$

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232. Define continuity of a function at a point.

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233. What happens to a function $f(x)$ at $x = a$, if $(\lim)_{x \rightarrow a} f(x) = f(a)$

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234. Find $f(0)$, so that $f(x) = \frac{x}{1 - \sqrt{1-x}}$ becomes continuous at $x = 0$.

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235. The function $f(x) = \begin{cases} \frac{\sin 3x}{x} & x \neq 0 \\ \frac{k}{2} & x = 0 \end{cases}$ is continuous of $x = 0$, then $k =$ (a) 3 (b) 6 (c) 9 (d) 12

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236. If the function $f(x) = \frac{\sin 10x}{x}$, $x \neq 0$ is continuous at $x = 0$, find $f(0)$.

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237. If $f(x) = \begin{cases} \frac{x^2 - 16}{x - 4}, & \text{if } x \neq 4 \\ k, & \text{if } x = 4 \end{cases}$ is continuous at $x = 4$, find k .

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238. Determine whether $f(x) = \begin{cases} \frac{\sin x^2}{x} & , x \neq 0 \\ k & , x = 0 \end{cases}$ is continuous at $x = 0$ or not.

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239. If $f(x) = \begin{cases} \frac{1 - \cos x}{x^2} & , x \neq 0 \\ k & , x = 0 \end{cases}$ is continuous at $x = 0$, find k .

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240. If $f(x) = \begin{cases} \frac{\sin^{-1} x}{x} & , x \neq 0 \\ k & , x = 0 \end{cases}$ is continuous at $x = 0$, write the value of k .

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241. Write the value of b for which $f(x) = \begin{cases} 5x - 4, & \text{when } 0 < x \leq 1 \\ 4x^2 + 3bx & , \text{when } 1 < x < 2 \end{cases}$ is continuous at $x = 1$



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242. The function $f(x) = \frac{4 - x^2}{4x - x^3}$ (a) discontinuous at only one point (b) discontinuous exactly at two points (c) discontinuous exactly at three points (d) none of these



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243. If $f(x) = |x - a|\varphi(x)$, where $\varphi(x)$ is continuous function, then $f'(a^+) = \varphi(a)$ (b) $f'(a^-) = -\varphi(a)$ (c) $f'(a^+) = f'(a^-)$ (d) none of these



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244. If $f(x) = |(\log)_{10}x|$, then at $x = 1$ $f(x)$ is continuous and $f'(1^+) = (\log)_{10}e$ $f(x)$ is continuous and $f'(1^+) = (\log)_{10}e$ $f(x)$ is

continuous and $f'(1^-) = (\log)_{10}e$ $f(x)$ is continuous and $f'(1^-) = -(\log)_{10}e$

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245. If $f(x) = \begin{cases} \frac{36^x - 9^x - 4^x + 1}{\sqrt{2} - \sqrt{1 + \cos x}}, & x \neq 0 \\ k, & x = 0 \end{cases}$ is continuous at $x = 0$, then k equal to

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246. If $f(x)$ defined by $f(x) = \begin{cases} \frac{|x^2 - x|}{x^2 - |x|}, & x \neq 0, 1 \\ 1, & x = 0, 1 \end{cases}$. Then (A) $f(x)$ is continuous for all x (B) for all x except $x = 0$ (C) for all x except $x = 1$ (D) for all x except $x = 0$ and $x = 1$

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247.

If

$$f(x) = \begin{cases} \frac{1 - \sin x}{(\pi - 2x)^2} \frac{\log \sin x}{(\log(1 + \pi^2 - 4\pi x + 4x^2))}, & x \neq \frac{\pi}{2}, \\ k & \text{at } x = \frac{\pi}{2} \end{cases}$$

is continuous at $x = \frac{\pi}{2}$, then $k = -\frac{1}{16}$ (b) $-\frac{1}{32}$ (c) $-\frac{1}{64}$ (d) $-\frac{1}{28}$


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248. If $f(x) = (x + 1)^{\cot x}$ be continuous at $x = 0$, the $f(0)$ is equal to


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249.

If

$$f(x) = \begin{cases} \frac{\log(1 + ax) - \log(1 - bx)}{x}, & x \neq 0, \\ k, & x = 0 \end{cases}$$

and $f(x)$ is continuous at $x = 0$, then the value of k is $a - b$ (b) $a + b$

(c) $\log a + \log b$ (d) none of these


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250. The function $f(x) = \begin{cases} e^{\frac{1}{x}} - 1, & x \neq 0 \\ 0, & x = 0 \end{cases}$ at $x = 0$

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251. Let

$$f(x) = \begin{cases} \frac{x-4}{|x-4|} + a, & x < 4 \\ a + b, & x = 4 \\ \frac{x-4}{|x-4|} + b, & x > 4 \end{cases}$$

Then $f(x)$ is continuous at $x = 4$ when

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252. If the function $f(x) = \begin{cases} (\cos x)^{\frac{1}{x}}, & x \neq 0 \\ k, & x = 0 \end{cases}$ is continuous at $x = 0$, then the value of k is (a) 0 (b) 1 (c) -1 (d) None of these

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253. Let $f(x) = |x| + |x - 1|$, then (a) $f(x)$ is continuous at $x = 0$, as well at $x = 1$ (b) $f(x)$ is continuous at $x = 0$, but not at $x = 1$ (c) $f(x)$ is

continuous at $x = 1$, but not at $x = 0$ (d) none of these



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254.

Let

$$f(x) = \begin{cases} \frac{x^4 - 5x^2 + 4}{|(x-1)(x-2)|} & , x \neq 1, 2 \\ 16 & , x = 1, 2 \end{cases}$$

. Then, $f(x)$ is continuous on the set R (b) $R - \{1\}$ (c) $R - \{2\}$ (d) $R - \{1, 2\}$



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255.

If

$$f(x) = \begin{cases} \frac{\sin(a+1)x + \sin x}{x} & , x < 0 \\ c & , x = 0 \\ \frac{\sqrt{x+bx^2} - \sqrt{a}}{bx\sqrt{x}} & , x > 0 \end{cases}$$

is continuous at $x = 0$, then (a) $a = -\frac{3}{2}, b = 0, c = \frac{1}{2}$ (b) $a = -\frac{3}{2}, b = 1, c = -\frac{1}{2}$ (c) $a = -\frac{3}{2}, b \in R - [0], c = \frac{1}{2}$ (d) none

of these



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256. If $f(x) = \begin{cases} mx + 1, & x \leq \frac{\pi}{2}, \\ \sin x + n, & x > \frac{\pi}{2} \end{cases}$ is continuous at $x = \frac{\pi}{2}$, then

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257. The value of $f(0)$, so that the function $f(x) = \frac{\sqrt{a^2 - ax + x^2} - \sqrt{a^2 + ax + x^2}}{\sqrt{a+x} - \sqrt{a-x}}$ becomes continuous for all x , given by $a^{\frac{3}{2}}$ (b) $a^{\frac{1}{2}}$ (c) $-a^{\frac{1}{2}}$ (d) $-a^{\frac{3}{2}}$

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258. The value of $f(0)$, so that the function $f(x) = \frac{(27 - 2x)^{\frac{1}{3}} - 3}{9 - 3(243 + 5x)^{1/5}}$ ($x \neq 0$) is continuous, is given by (a) $\frac{2}{3}$ (b) 6 (c) 2 (d) 4

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259. The value of $f(0)$ so that the function

$$f(x) = \frac{2 - (256 - 7x)^{\frac{1}{8}}}{(5x + 32)^{1/5} - 2}, x \neq 0 \text{ is continuous everywhere, is given by}$$

-1 (b) 1 (c) 26 (d) none of these



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260. $f(x) = \begin{cases} \frac{\sqrt{1+px} - \sqrt{1-px}}{x}, & -1 \leq x < 0 \\ \frac{2x+1}{x-2}, & 0 \leq x \leq 1 \end{cases}$

is continuous in the interval $[-1, 1]$, then p is equal to -1 (b) $-\frac{1}{2}$ (c) $\frac{1}{2}$ (d) 1



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261. The function $f(x) = \begin{cases} x^2 a, & 0 \leq x < 1, \\ a, & 1 \leq x \end{cases}$ is

continuous then find the value of constant term



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262. If $f(x) = \frac{1 - \sin x}{(\pi - 2x)^2}$, when $x \neq \frac{\pi}{2}$ and $f\left(\frac{\pi}{2}\right) = \lambda$, the $f(x)$ will be continuous function at $x = \frac{\pi}{2}$, where $\lambda = \frac{1}{8}$ (b) $\frac{1}{4}$ (c) $\frac{1}{2}$ (d) none of these

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263. The value of a for which the function $f(x) = f(x) = \begin{cases} (4^x - 1)\hat{3} \\ \sin(xa)\log\{(1 + x^2)3\} \end{cases}$, $x \neq 0$ $12(\log 4)^3$, $x = 0$ may be continuous at $x = 0$ is 1 (b) 2 (c) 3 (d) none of these

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264. The function $f(x) = \tan x$ is discontinuous on the set

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265. The function $f(x) = \begin{cases} \frac{\sin 3x}{x}, & x \neq 0 \\ k, & x = 0 \end{cases}$ is continuous at $x = 0$, then $k =$ (a) 3 (b) 6 (c) 9 (d) 12

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266. If the function $f(x) = \frac{2x - \sin^{-1} x}{2x + \tan^{-1} x}$ is continuous at each point of its domain, then the value of $f(0)$ is (a) 2 (b) $\frac{1}{3}$ (c) $-\frac{1}{3}$ (d) $\frac{2}{3}$

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267. The value of a for which the function $f(x) = \begin{cases} 5x - 4 & x > 0 \\ a & x = 0 \\ 0 & x < 0 \end{cases}$ is continuous at $x = 0$

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268. If $f(x) = \frac{1}{1-x}$, then the set of points of discontinuity of the function $f(f(f(x)))$ is (a) $\{1\}$ (b) $\{0,1\}$ (c) $\{-1,1\}$ (d) none of these

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269. Let $f(x) = \frac{\tan\left(\frac{\pi}{4} - x\right)}{\cot 2x}$, $x \neq \frac{\pi}{4}$. The value which should be assigned to $f(x)$ at $x = \frac{\pi}{4}$, so that it is continuous everywhere is 1 (b) $\frac{1}{2}$ (c) 2 (d) none of these

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270. The function $f(x) = \frac{x^3 + x^2 - 16x + 20}{x - 2}$ is not defined for $x = 2$. In order to make $f(x)$ continuous at $x = 2$, $f(2)$ should be defined as 0 (b) 1 (c) 2 (d) 3

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271. If $f(x) = \begin{cases} a \frac{\sin \pi}{2}(x + 1), & x \leq 0 \\ \frac{\tan x - \sin x}{x^3}, & x > 0 \end{cases}$ is continuous at $x = 0$, then a equal $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{1}{4}$ (d) $\frac{1}{6}$

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272. If $f(x) = \begin{cases} ax^2 + b, & 0 \leq x < 4 \\ 1x + 3, & x = 4 \end{cases}$



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273. If the function $f(x)$ defined by

$$f(x) = \begin{cases} \frac{\log(1+3x) - \log(1-2x)}{x}, & x \neq 0 \\ k, & x = 0 \end{cases}$$

is continuous at $x = 0$, then $k =$ (a) 1 (b) 5 (c) -1 (d) none of these



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274. If

$$f(x) = \begin{cases} \frac{1 - \cos 10x}{x^2}, & x < 0 \\ a, & x = 0 \\ \frac{\sqrt{x}}{\sqrt{625 + \sqrt{x}} - 25}, & x > 0 \end{cases}$$

, then the value of a so that $f(x)$ may be continuous at $x = 0$, is (a) 25

(b) 50 (c) -25 (d) none of these



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275. If $f(x) = x \sin\left(\frac{1}{x}\right)$, $x \neq 0$, then the value of the function at $x = 0$, so that the function is continuous at $x = 0$, is (a) 0 (b) -1 (c) 1 (d) indeterminate

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276. The value of k which makes $f(x) = \begin{cases} \frac{\sin 1}{x}, & x \neq 0 \\ k, & x = 0 \end{cases}$ continuous at $x = 0$, is (a) 8 (b) 1 (c) -1 (d) none of these

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277. The values of the constants a, b, c for which the function $f(x) = \begin{cases} (1 + ax)^{1/x}, & x < 0 \\ \frac{(x + c)^{\frac{1}{3}} - 1}{(x + 1)^{\frac{1}{2}} - 1}, & x > 0 \end{cases}$ and $b, x = 0$ may be continuous at $x = 0$, are

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278. The points of discontinuity of the function

$$f(x) = \begin{cases} 2\sqrt{x} & , 0 \leq x \leq 1, \\ 4 - 2x & , 1 < x \end{cases}$$

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279. If $f(x) = \left\{ \begin{array}{ll} \frac{1 - \sin^2 x}{3 \cos^2 x} & x < \frac{\pi}{2} \\ a & x = \frac{\pi}{2} \\ \frac{b(1 - \sin x)}{(\pi - 2x)^2} & x > \frac{\pi}{2} \end{array} \right\}$ then $f(x)$ is continuous at $x = \frac{\pi}{2}$

,if

(a) $a = \frac{1}{3}, b = 2$ (b) $a = \frac{1}{3}, b = \frac{8}{3}$ (c) $a = \frac{2}{3}, b = \frac{8}{3}$ (d) none of these

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280. The points of discontinuity of the function

$$f(x) = \begin{cases} \frac{1}{5} (2x^2 + 3) & , x \leq 1, \\ 6 - 5x & , 1 < x \end{cases}$$

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281. The value of a for which the function $f(x) = \begin{cases} 5x - 4 & \text{if } x < 0 \\ a & \text{if } x = 0 \\ 5x + 4 & \text{if } x > 0 \end{cases}$ is



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282. If $f(x) = \begin{cases} \frac{\sin(\cos x) - \cos x}{(\pi - 2x)^2} & , x \neq \frac{\pi}{2} \\ k & , x = \frac{\pi}{2} \end{cases}$ is continuous at $x = \frac{\pi}{2}$, then k is equal to (a) 0 (b) $\frac{1}{2}$ (c) 1 (d) -1



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