

## Problems of Continuity of functions

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1) Find out the continuity of the following function at the point  $x = 2$ :

$$f(x) = \begin{cases} 4x + 7 & \text{if } x < 2 \\ 18 & \text{if } x = 2 \\ x + 13 & \text{if } x > 2 \end{cases}$$

2) Find out the continuity of the following function at the point  $x = -2$ :

$$f(x) = \begin{cases} \frac{-7}{x+1} & \text{if } x < -2 \\ 2x^2 - 6x - 13 & \text{if } x \geq -2 \end{cases}$$

3) Find out the continuity of the following function at the point  $x = 0$ :

$$f(x) = \begin{cases} 4x + 9 & \text{if } x < 0 \\ x^2 + 6x + 9 & \text{if } x \geq 0 \end{cases}$$

4) Find out the continuity of the following function at the point  $x = 9$ :

$$f(x) = \begin{cases} 3x + 15 & \text{if } x \leq 9 \\ \frac{3x + 10}{x - 8} & \text{if } x > 9 \end{cases}$$

5) Find out the continuity of the following function at the point  $x = 3$ :

$$f(x) = \begin{cases} x^2 + 3x - 9 & \text{if } x < 3 \\ e^{x-3} & \text{if } x \geq 3 \end{cases}$$

6) Find out the value of the parameter  $r$  for which the following function is continuous on  $\mathfrak{R}$ .

$$f(x) = \begin{cases} 3x^2 + 3x - 5 & \text{if } x < 1 \\ \frac{2}{rx - 2} & \text{if } x \geq 1 \end{cases}$$

7) Find out the value of the parameter  $n$  for which the following function is continuous on  $\mathfrak{R}$ .

$$f(x) = \begin{cases} x^2 + 4x + 5 & \text{if } x < -2 \\ \sqrt{x^2 + n} & \text{if } x \geq -2 \end{cases}$$

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8) Calculate the value of the parameter  $h$  for which the following function is continuous on  $\mathfrak{R}$ .

$$f(x) = \begin{cases} h & \text{if } x = 3 \\ \frac{x^4 - 81}{2x - 6} & \text{if } x \neq 3 \end{cases}$$

9) Find out the value of the parameter  $a$  for which the following function is continuous on  $\mathfrak{R}$ .

$$f(x) = \begin{cases} x^2 + ax + 11 & \text{if } x < -4 \\ a - x^2 & \text{if } x \geq -4 \end{cases}$$

10) Find out the value of the parameter  $q$  for which the following function is continuous on  $\mathfrak{R}$ .

$$f(x) = \begin{cases} x^2 + qx + 6 & \text{if } x < -1 \\ e^{x+1} + 2 & \text{if } x \geq -1 \end{cases}$$

11) Find out the value of the parameters  $p$  and  $r$  for which the following function is continuous on  $\mathfrak{R}$ .

$$f(x) = \begin{cases} -x^2 - 3 & \text{if } x < -1 \\ \frac{x+p}{x^2+r} & \text{if } -1 \leq x < 2 \\ -4 + e^{x-2} & \text{if } x \geq 2 \end{cases}$$

12) Find out the value of the parameters  $m$  and  $p$  for which the following function is continuous on  $\mathfrak{R}$ .

$$f(x) = \begin{cases} x^2 - 15 & \text{if } x \leq -4 \\ \sqrt{mx+p} & \text{if } -4 < x < -1 \\ 1 + 7e^{x+1} & \text{if } x \geq -1 \end{cases}$$

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13) Calculate the value of the parameters  $p$  and  $q$  for which the following function is continuous on  $\mathfrak{R}$ .

$$f(x) = \begin{cases} x^2 + p + e^{x+2} & \text{if } x < -2 \\ -x^2 + 7x - 8 & \text{if } -2 \leq x \leq 1 \\ \frac{x - 39}{x^2 + q} & \text{if } x > 1 \end{cases}$$

14) Find out the value of the parameters  $u$  and  $v$  for which the following function is continuous on  $\mathfrak{R}$ .

$$f(x) = \begin{cases} x^2 + ux & \text{if } x < -2 \\ 5x - 6 & \text{if } -2 \leq x \leq 2 \\ \frac{x + v}{x^2 + 4} & \text{if } x > 2 \end{cases}$$

15) Find out the value of the parameters  $u$  and  $v$  for which the following function is continuous on  $\mathfrak{R}$ .

$$f(x) = \begin{cases} x^2 + 16 & \text{if } x \leq -2 \\ ux + v & \text{if } -2 < x < 0 \\ \frac{x}{x^2 + 9} & \text{if } x \geq 0 \end{cases}$$

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### Answers:

- 1) Removable discontinuity
- 2) Continuous
- 3) Continuous
- 4) Jump discontinuity
- 5) Jump discontinuity
- 6)  $r = 4$
- 7)  $n = -3$
- 8)  $h = 54$
- 9)  $a = \frac{43}{5}$
- 10)  $q = 4$
- 11)  $p = -47, r = 11$
- 12)  $m = 21, p = 85$
- 13)  $p = -31, q = 18$
- 14)  $u = 10, v = 30$
- 15)  $u = -10, v = 0$