1.13 Removing Discontinuities

Calculus

1. If the function f is continuous for all real numbers and if $f(x) = \frac{x^2-9}{x-3}$ when $x \neq 3$, then f(3) =



3. If the function f is continuous for all real numbers and if $f(x) = \frac{x^2 - 5x + 4}{x - 1}$ when $x \neq 1$, then f(1) =



$$\frac{(x-1)(x-4)}{x-1} \quad \lim_{x\to 1} f(x) = -3$$

5. Let f be the function defined by

$$f(x) = \begin{cases} \frac{x^2 - 2x - 15}{x - 5}, & x \neq 5 \\ a, & x = 5 \end{cases}.$$

For what value of a is f continuous at x = 5?

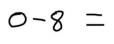


7. Let f be the function defined by

$$f(x) = \begin{cases} \frac{x^2 - 8x}{x}, & x \neq 0 \\ c, & x = 0 \end{cases}$$

For what value of c is f continuous at x = 0?



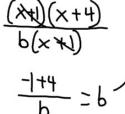




9. Let f be the function defined by

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

For what value of b is f continuous at $x = -1$?





Solutions

Practice

2. If the function f is continuous for all real numbers and if $f(x) = \frac{x^2 + 8x - 20}{x + 10}$ when $x \neq -10$, then f(-10)



4. If the function f is continuous for all real numbers and if $f(x) = \frac{x^2 + 14x + 48}{x + 8}$ when $x \neq -8$, then f(-8) =

6. Let f be the function defined by

$$f(x) = \begin{cases} \frac{x^2 - 16x + 63}{x - 7}, & x \neq 7 \\ b, & x = 7 \end{cases}$$

For what value of b is f continuous at x = 7?



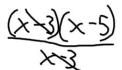




8. Let f be the function defined by

$$f(x) = \begin{cases} \frac{x^2 - 8x + 15}{x - 3}, & x \neq 3 \\ a, & x = 3 \end{cases}$$

For what value of a is f continuous at x = 3?

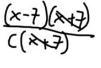




10. Let f be the function defined by

$$f(x) = \begin{cases} \frac{x^2 - 49}{c(x+7)}, & x \neq -7 \\ c, & x = -7 \end{cases}$$

For what value of c is f continuous at x = -7?









No such value of c.

11. Let f be the function defined by

$$f(x) = \begin{cases} \frac{\sin(6x)}{5x}, & x \neq 0 \\ a, & x = 0 \end{cases}$$

For what value of a is f continuous at x = 0?

12. Let f be the function defined by

$$f(x) = \begin{cases} \frac{5\sin(3x)}{4x}, & x \neq 0 \\ b, & x = 0 \end{cases}$$

For what value of b is f continuous at x = 0?

$$\lim_{x\to 0} 5(x) = \frac{5.3}{4} = \frac{15}{4}$$
 $b = \frac{15}{4}$

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Test Prep

13. Let $y = \frac{x^2 + 4x - 21}{x^2 - 9}$. This function has a hole. What is the y-value of the hole?



$$\frac{(x+7)(x+3)}{(x+3)(x+3)} = \frac{x+7}{x+3} \qquad \lim_{x \to 3} y = \frac{3+7}{3+3} = \frac{16}{6}$$

$$\lim_{x \to 3} y = \frac{3+7}{3+3} = \frac{19}{6}$$



- (B) 3 (C) $-\frac{10}{3}$ (D) 0
- (E) -3

14. For what value of k will the function $f(x) = \frac{x^2 - (k+2)x + 6}{x - k}$ have a point discontinuity at x = k?

Factor numerator $\rightarrow \frac{(x-k)(x-2)}{x-k}$

(-K)(-2) must equal 6

- (A) k = -1
- (B) k = 0 (C) k = 1 (D) k = 2
- (E) k = 3