Calculus

# 1.13 Removing Discontinuities

**Notes**

Write your questions and thoughts here!

**Recall:** What is a removable discontinuity?

$$\lim_{x\to c} f(x) \text{ exists, but } \lim_{x\to c} f(x) \neq f(c)$$

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

| Find the $x$-value of the hole. | How do we find the $y$-value? |
|---|---|

2. If the function $f$ is continuous for all real numbers and if $f(x) = \frac{x^2+6x+8}{x+4}$ when $x \neq -4$, then $f(-4) =$

3. Let $f$ be the function defined by $f(x) = \begin{cases} \frac{x^2-3x-18}{x-6}, & x \neq 6 \\ a, & x = 6 \end{cases}$. For what value of $a$ is $f$ continuous at $x = 6$?

## 1.13 Removing Discontinuities

Calculus

**Practice**

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 $f(3) =$

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 $f(-10) =$

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 $f(1) =$

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 $f(-8) =$

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 $x = 5$?

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 $x = 7$?

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 $x = 0$?

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 $x = 3$?

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 $x = -1$?

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 $x = -7$?

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 $x = 0$?

## 1.13 Removing Discontinuities

**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?

(A) $\frac{5}{3}$ (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 $x = k$?

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