

# When an Expression Is Undefined

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Score: \_\_\_\_\_ / 18

## Quick Review and Helpful Hints

A fraction is *undefined* when its denominator equals 0, because dividing by zero is not allowed. To find where an expression is undefined, set the *denominator* equal to 0 and solve for  $x$ .

▶ **Example:** For what value of  $x$  is  $\frac{1}{x-2}$  undefined? **Work:** Set the denominator to 0:  $x - 2 = 0$ , so  $x = 2$ . ★ **Answer:**  $x = 2$



Never divide by zero.

### ◆ Practice Problems

Find where each expression is undefined.

- |   |   |
|---|---|
| <p>1. <math>\frac{1}{x-2}</math> _____</p> <p>2. <math>\frac{1}{x+3}</math> _____</p> <p>3. <math>\frac{1}{x}</math> _____</p> <p>4. <math>\frac{5}{x-1}</math> _____</p> <p>5. <math>\frac{1}{x+5}</math> _____</p> <p>6. <math>\frac{2}{x-4}</math> _____</p> <p>7. <math>\frac{1}{2x}</math> _____</p> | <p>8. <math>\frac{1}{x-7}</math> _____</p> <p>9. <math>\frac{3}{x+1}</math> _____</p> <p>10. <math>\frac{1}{x-10}</math> _____</p> <p>11. <math>\frac{1}{x+2}</math> _____</p> <p>12. <math>\frac{4}{x-6}</math> _____</p> <p>13. Can you divide by 0? _____</p> <p>14. <math>\frac{1}{x}</math> undefined at _____</p> |
|---|---|

### ◆ Word Problems

15. A formula has  $x - 3$  in the denominator. Where is it undefined? \_\_\_\_\_
16. For what value is  $\frac{1}{x+4}$  undefined? \_\_\_\_\_
17. Why is  $\frac{5}{0}$  undefined? \_\_\_\_\_
18. At what value is  $\frac{1}{x-9}$  undefined? \_\_\_\_\_



## Answer Keys

- |             |              |                      |
|-------------|--------------|----------------------|
| 1. $x = 2$  | 7. $x = 0$   | 13. No               |
| 2. $x = -3$ | 8. $x = 7$   | 14. $x = 0$          |
| 3. $x = 0$  | 9. $x = -1$  | 15. $x = 3$          |
| 4. $x = 1$  | 10. $x = 10$ | 16. $x = -4$         |
| 5. $x = -5$ | 11. $x = -2$ | 17. division by zero |
| 6. $x = 4$  | 12. $x = 6$  | 18. $x = 9$          |

### Step-by-Step Explanations

1. Start by naming the process: A fraction is undefined when its denominator is zero, so set the denominator equal to zero and solve. The setup/work is  $x - 2 = 0 \Rightarrow x = 2$ . So the final answer is  $x = 2$ .
2. A good way to think about this is: A fraction is undefined when its denominator is zero, so set the denominator equal to zero and solve. The setup/work is  $x + 3 = 0 \Rightarrow x = -3$ . So the final answer is  $x = -3$ .
3. Step by step: A fraction is undefined when its denominator is zero, so set the denominator equal to zero and solve. The setup/work is  $x = 0$  makes the bottom 0. So the final answer is  $x = 0$ .
4. Take it one move at a time: A fraction is undefined when its denominator is zero, so set the denominator equal to zero and solve. The setup/work is  $x - 1 = 0 \Rightarrow x = 1$ . So the final answer is  $x = 1$ .
5. Start by naming the process: A fraction is undefined when its denominator is zero, so set the denominator equal to zero and solve. The setup/work is  $x + 5 = 0 \Rightarrow x = -5$ . So the final answer is  $x = -5$ .
6. A good way to think about this is: A fraction is undefined when its denominator is zero, so set the denominator equal to zero and solve. The setup/work is  $x - 4 = 0 \Rightarrow x = 4$ . So the final answer is  $x = 4$ .
7. Step by step: A fraction is undefined when its denominator is zero, so set the denominator equal to zero and solve. The setup/work is  $2x = 0 \Rightarrow x = 0$ . So the final answer is  $x = 0$ .
8. Take it one move at a time: A fraction is undefined when its denominator is zero, so set the denominator equal to zero and solve. The setup/work is  $x - 7 = 0 \Rightarrow x = 7$ . So the final answer is  $x = 7$ .
9. Start by naming the process: A fraction is undefined when its denominator is zero, so set the denominator equal to zero and solve. The setup/work is  $x + 1 = 0 \Rightarrow x = -1$ . So the final answer is  $x = -1$ .
10. A good way to think about this is: A fraction is undefined when its denominator is zero, so set the denominator equal to zero and solve. The setup/work is  $x - 10 = 0 \Rightarrow x = 10$ . So the final answer is  $x = 10$ .
11. Step by step: A fraction is undefined when its denominator is zero, so set the denominator equal to zero and solve. The setup/work is  $x + 2 = 0 \Rightarrow x = -2$ . So the final answer is  $x = -2$ .
12. Take it one move at a time: A fraction is undefined when its denominator is zero, so set the denominator equal to zero and solve. The setup/work is  $x - 6 = 0 \Rightarrow x = 6$ . So the final answer is  $x = 6$ .
13. Start by naming the process: A fraction is undefined when its denominator is zero, so set the denominator equal to zero and solve. The setup/work is No - division by zero is undefined. So the final answer is No.
14. A good way to think about this is: A fraction is undefined when its denominator is zero, so set the denominator equal to zero and solve. The setup/work is  $x = 0$  makes the bottom 0. So the final answer is  $x = 0$ .
15. Step by step: A fraction is undefined when its denominator is zero, so set the denominator equal to zero and solve. The setup/work is  $x - 3 = 0 \Rightarrow x = 3$ . So the final answer is  $x = 3$ .
16. Take it one move at a time: A fraction is undefined when its denominator is zero, so set the denominator equal to zero and solve. The setup/work is  $x + 4 = 0 \Rightarrow x = -4$ . So the final answer is  $x = -4$ .
17. Start by naming the process: A fraction is undefined when its denominator is zero, so set the denominator equal to zero and solve. The setup/work is The denominator is 0 (dividing by zero). So the final answer is division by zero.
18. A good way to think about this is: A fraction is undefined when its denominator is zero, so set the denominator equal to zero and solve. The setup/work is  $x - 9 = 0 \Rightarrow x = 9$ . So the final answer is  $x = 9$ .



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