

# 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.

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

### 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.  $x = 2$

2.  $x = -3$

3.  $x = 0$

4.  $x = 1$

5.  $x = -5$

6.  $x = 4$

7.  $x = 0$

8.  $x = 7$

9.  $x = -1$

10.  $x = 10$

11.  $x = -2$

12.  $x = 6$

13. No

14.  $x = 0$

15.  $x = 3$

16.  $x = -4$

17. division by zero

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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