

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