

01 / LEARN THE METHOD

Rational Equation Error Clinic

Domain checks and extraneous solutions

For Algebra II or college algebra. Each problem asks for a solution set, not only a transformed equation. Work over the real numbers. This is independent practice, not an official course exam.

Keep these distinctions clear

1. Write excluded values from every original denominator before simplifying. A canceled denominator factor still creates an exclusion.
2. Multiply every term on both sides by a least common denominator. This transformation is valid only where the original denominators are nonzero.
3. Solve the resulting equation, reject excluded candidates, then substitute remaining candidates into the original equation.
4. An identity can have infinitely many solutions within the original domain. A contradiction has none. Do not confuse either case with one numerical solution.

Worked example: $(x^2 - 1)/(x - 1) = 2$

Original domain: x is not 1.

Factor the numerator: $(x - 1)(x + 1)/(x - 1) = 2$.

For x not equal to 1, simplify to $x + 1 = 2$, producing candidate $x = 1$.

Reject $x = 1$ because the original denominator is zero. Final solution set: empty. A neat candidate is not automatically a valid solution.

02 / TRY IT WITHOUT THE KEY

Practice set

Write the reasoning, not only the answer.

1. Solve $2/(x - 1) = 3/(x + 2)$. List exclusions first.
2. Solve $x/(x - 2) = 2/(x - 2)$. Is the candidate valid?
3. Solve $1/(x - 1) + 1/(x + 1) = 1$. Keep exact radical answers.
4. Solve $(x^2 - 9)/(x - 3) = 6$. Explain any rejection.
5. Solve $3/x + 1/2 = 5/2$. Check your result in the original equation.
6. Solve $(x + 1)/(x - 2) = 2$. Show the denominator-clearing step.
7. Solve $1/(x - 1) = (x + 1)/(x^2 - 1)$. State the complete solution set.
8. Solve $(x^2 - 4)/(x - 2) = x + 3$. Decide whether it is an identity or contradiction.

03 / CHECK AND CORRECT

Answers with reasoning

1. Exclude 1 and -2. $2(x + 2) = 3(x - 1)$ gives $x = 7$. Both original sides equal $1/3$.
2. Exclude 2. Clearing denominators gives $x = 2$, which is excluded. No solution.
3. Exclude -1 and 1. $2x = x^2 - 1$ gives $x = 1 + \sqrt{2}$ or $1 - \sqrt{2}$. Neither is excluded; both satisfy the original equation.
4. Exclude 3. Simplifying gives $x + 3 = 6$, so candidate $x = 3$ is excluded. No solution.
5. Exclude 0. $3/x = 2$ gives $x = 3/2$. Check: $3/(3/2) + 1/2 = 2 + 1/2 = 5/2$.
6. Exclude 2. $x + 1 = 2(x - 2)$, so $x = 5$. Check: $6/3 = 2$.
7. Exclude -1 and 1 from $x^2 - 1$. Both sides are identical elsewhere. All real numbers except -1 and 1 solve it.
8. Exclude 2. Simplifying gives $x + 2 = x + 3$, a contradiction. No real solution.

Reference reading

[OpenStax Intermediate Algebra 2e, Solve Rational Equations](#)

[OpenStax Elementary Algebra 2e, Solve Rational Equations](#)

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