

Algebra 2 · Rational Expressions and Equations

· Worksheet

Common Core A-APR.D.6, A-APR.D.7, A-REI.A.2 · mathovore.fr

Name: _____ Date: ____/____/____ Score: _____

These 22 problems practice simplifying, multiplying, dividing, adding, and subtracting rational expressions, rewriting them with long division, and solving rational equations (A-APR.D.6, A-APR.D.7, A-REI.A.2).

The last problems are work, rate, and cost applications. Check every solution of a rational equation in the original equation, because extraneous solutions are common.

Algebra 2 Common Core: A-APR.D.6 · A-APR.D.7 · A-REI.A.2

Problem 1: Find the excluded values

Find all values of x that must be excluded.

- a. $\frac{5}{x-4}$
- b. $\frac{x+1}{x^2-9}$
- c. $\frac{7}{x^2+x-6}$

Problem 2: Simplify monomial quotients

Simplify. Assume no denominator is zero.

- a. $\frac{18x^4}{24x^2}$
- b. $\frac{20x^3y}{35xy^2}$

Problem 3: Simplify by factoring

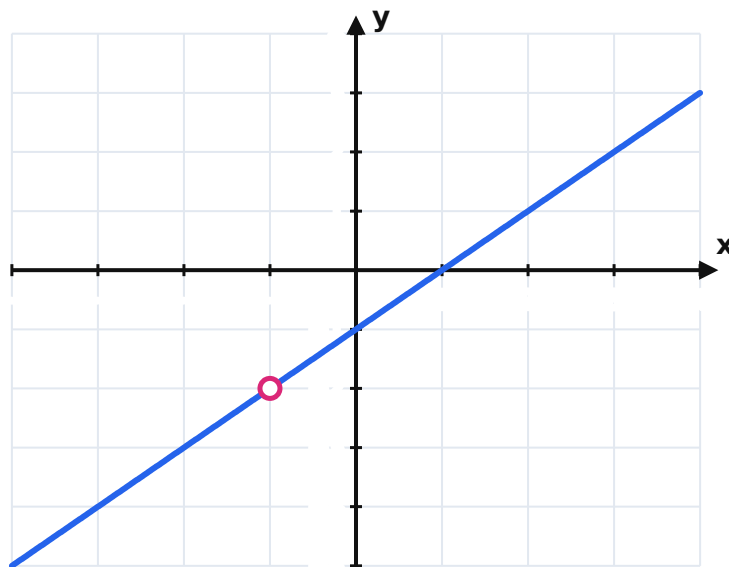
Simplify each expression and state the excluded values.

- a. $\frac{x^2-9}{x^2+x-6}$
- b. $\frac{x^2+5x+6}{x^2+3x+2}$

Problem 4: Why the graph has a hole

The graph of $y = \frac{x^2-1}{x+1}$ is shown. Simplify the expression, then explain why the graph has a

hole and give its coordinates.



The graph of $y = \frac{x^2-1}{x+1}$ has an open circle.

Problem 5: Opposite factors

Simplify. State the excluded values.

- a. $\frac{4-x}{x-4}$
- b. $\frac{9-x^2}{x-3}$

Problem 6: Multiply rational expressions

Multiply and simplify.

- a. $\frac{x^2-4}{x+5} \cdot \frac{2x+10}{x-2}$
- b. $\frac{x^2+3x}{x^2-1} \cdot \frac{x-1}{x}$

Problem 7: Divide rational expressions

Divide and simplify.

- a. $\frac{x^2-x-6}{x+4} \div \frac{x-3}{x^2-16}$
- b. $\frac{6x^2}{5y} \div \frac{3x}{10y^2}$

Problem 8: Same denominator

Add or subtract and simplify.

a. $\frac{3x+1}{x+4} + \frac{2x-5}{x+4}$
 b. $\frac{5x+2}{x-1} - \frac{2x-7}{x-1}$

Problem 9: Different denominators

Add or subtract and simplify.

a. $\frac{2}{x} + \frac{3}{x+1}$
 b. $\frac{5}{6x} - \frac{1}{4x^2}$

Problem 10: Binomial denominators

Subtract and simplify: $\frac{4}{x-2} - \frac{3}{x+3}$

Problem 11: Factor the denominators first

Combine and simplify.

a. $\frac{x}{x^2-9} - \frac{1}{x-3}$
 b. $\frac{2}{x^2-x-6} + \frac{1}{x+2}$

Problem 12: Rewrite using long division

Use long division to rewrite each expression as a polynomial plus a remainder term.

a. $\frac{x^2+3x+5}{x+1}$
 b. $\frac{2x^2-x-7}{x-2}$

Problem 13: Rewrite by inspection

Rewrite each expression in the form $a + \frac{r}{\text{denominator}}$.

a. $\frac{2x+7}{x+3}$
 b. $\frac{3x-4}{x-1}$

Problem 14: Solve a proportion-style equation

Solve each equation and check.

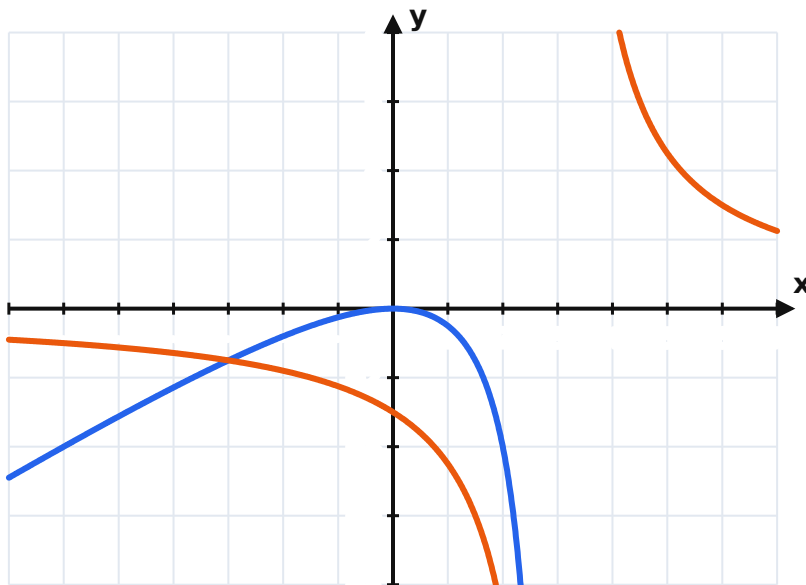
a. $\frac{3}{x} = \frac{5}{x+4}$
 b. $\frac{2}{x-1} = \frac{6}{x+3}$

Problem 15: Rational equation with a quadratic

Solve $\frac{1}{x} + \frac{1}{x+3} = \frac{1}{2}$. Check each solution.

Problem 16: Spot the extraneous solution

Solve $\frac{x^2}{x-3} = \frac{9}{x-3}$ algebraically. Then use the graphs to explain which answer is extraneous.



The graphs of $y = \frac{x^2}{x-3}$ and $y = \frac{9}{x-3}$.

Problem 17: Equation with no solution

Solve $\frac{x}{x-4} = \frac{4}{x-4} + 2$.

Problem 18: Average cost

The school store orders custom hoodies. The total cost of n hoodies is $C(n) = 120 + 8n$ dollars, so the average cost per hoodie is $A(n) = \frac{120 + 8n}{n}$.

- How many hoodies make the average cost \$11?
- Rewrite $A(n)$ as $8 + \frac{120}{n}$. What value does the average cost approach as n gets very large?

Problem 19: Painting a fence together

Maya can paint a fence in 6 hours. Jamal can paint the same fence in 3 hours. How long does it take them together?

Maya

6 hours

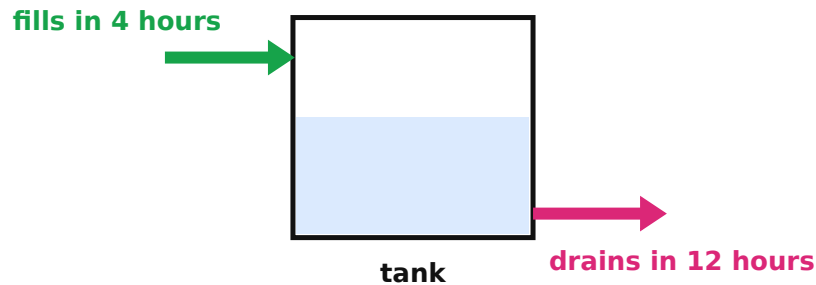
Jamal

3 hours

Time to paint the whole fence alone.

Problem 20: Fill pipe and drain

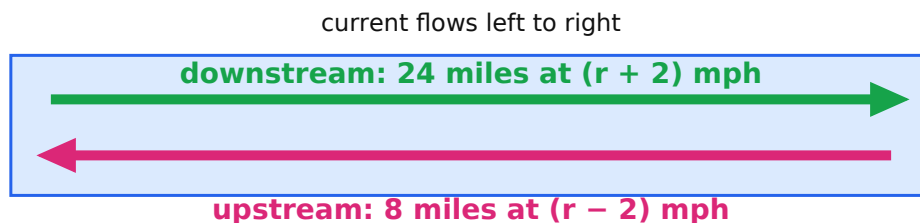
A pipe can fill a tank in 4 hours. A drain can empty a full tank in 12 hours. Both are open at the same time with the tank empty. How long does it take to fill the tank?



Pipe and drain on the same tank.

Problem 21: Boat on a river

Ethan's kayak goes 24 miles downstream and 8 miles back upstream in a total of 5 hours. The river current is 2 mph. Find the speed r of the kayak in still water.



Boat speed r in still water; the current is 2 mph.

Problem 22: Decorating the gym

Mei and Aisha can decorate the gym together in 4 hours. Mei can do the whole job alone in 6 hours. How long would Aisha take to do it alone?