

Rational Expressions and Functions: math practice, Grade 11 – download the PDF

21 problems graded by difficulty (★ easy, ★★ medium, ★★★ hard). Try first, without looking at the solutions!

1 Finding a domain

★ ★ ★

Find the domain of $f(x) = \frac{x+4}{x^2-25}$.

2 Simplifying a monomial quotient

★ ★ ★

Simplify $\frac{12x^3}{18x^2}$ and state any restriction.

3 Factoring a common factor

★ ★ ★

Simplify $\frac{5x+15}{x+3}$. What does the graph of this function look like?

4 Multiplying two fractions

★ ★ ★

Multiply $\frac{3x}{8} \cdot \frac{4}{9x^2}$ and simplify.

5 Same denominator

Add $\frac{2x+1}{x+4} + \frac{x+7}{x+4}$.

6 Reading asymptotes from the form

The function $f(x) = \frac{1}{x+3} - 2$ is a shifted version of $y = \frac{1}{x}$. Give its vertical and horizontal asymptotes.

7 A cyclist at steady speed

The distance d a cyclist covers varies directly with the time t . She rides 42 miles in 3 hours. How far does she ride in 5 hours at the same pace?

8 A trinomial over a difference of squares

Simplify $\frac{x^2 - 6x + 8}{x^2 - 4}$ and state the restrictions.

9 Dividing rational expressions

Compute $\frac{x^2 - 9}{x + 2} \div \frac{x + 3}{x^2 - 4}$ and state the restrictions.

10 Subtracting with different denominators

Subtract: $\frac{5}{x-2} - \frac{3}{x+4}$.

11 A first rational equation

Solve $\frac{5}{x} = \frac{3}{x-4}$.

12 Sketching a rational function

Let $f(x) = \frac{3x}{x+1}$.

- Find the vertical and horizontal asymptotes.
- Find the intercepts.
- Compute $f(2)$ and $f(-3)$, then describe the graph.

13 Painters on a fence

The time t needed to paint a fence varies inversely with the number n of painters. Eight painters need 9 hours. How long will 12 painters need?

14 True or false?

Decide whether each statement is true or false, and justify your answer.

- $\frac{x+5}{x+7} = \frac{5}{7}$ for all $x \neq -7$.
- $\frac{x^2-1}{x-1} = x+1$ for all $x \neq 1$.
- $\frac{1}{x} + \frac{1}{y} = \frac{2}{x+y}$.

15 A complex fraction

★★★

Simplify $\frac{\frac{1}{x} + \frac{1}{3}}{\frac{1}{x} - \frac{1}{3}}$ and give the restrictions.

16 Spot the extraneous solution

★★★

Solve $\frac{x}{x-4} - 2 = \frac{4}{x-4}$. Check your answer carefully.

17 A rational equation that becomes a quadratic

★★★

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

18 Two hoses fill a pool

★★★

Hose A fills a pool alone in t hours. Hose B alone needs 6 hours more. Together they fill it in 4 hours. How long does each hose need alone?

19 Designing a function

★★★

Write a rational function with vertical asymptote $x = 2$, horizontal asymptote $y = 3$ and x -intercept -1 . Then find its y -intercept.

20 Hole or asymptote?



Let $g(x) = \frac{x^2 - x - 6}{x - 3}$.

- Simplify g and locate the hole.
- Does g have a vertical asymptote?
- Find the y -intercept and sketch the graph.

21 Combined variation



The quantity y varies directly with x and inversely with z . When $x = 4$ and $z = 10$, $y = 6$. Find y when $x = 7$ and $z = 5$.



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