

Rational Routes

Solve equations and map rational function features.

HIGH SCHOOL • MA.912.AR.8

MA.912.AR.8 "Solve and graph rational equations and functions in one and two variables."

NAME _____

DATE _____

SOLVE AND SKETCH

Before solving a rational equation, identify any x-value that makes a denominator zero. Solve by multiplying by the denominator or the least common denominator, then check that each answer is allowed. For $y = a/(x-h) + k$, the graph has a vertical asymptote at $x = h$ and a horizontal asymptote at $y = k$.

WORKED EXAMPLE

Solve $12/(x-15) = 3$.

1. x cannot equal 15.
2. Multiply both sides by x-15: $12 = 3(x-15)$.
3. Distribute: $12 = 3x - 45$.
4. Solve: $x = 19$.

Answer: $x = 19$

PRACTICE 6 problems

1 Solve $8/(x-4) = 2$.

ANSWER _____

2 Solve $(x+6)/(x-5) = 2$.

ANSWER _____

3 Solve $1/(x+4) + 1/(x-4) = 1/2$.

ANSWER _____

4 Sketch $y = 6/(x+2) - 4$. State the vertical asymptote, horizontal asymptote, and two points on the graph.

ANSWER _____

5 Sketch $y = -8/(x-1) + 5$. State the vertical asymptote, horizontal asymptote, and two points on the graph.

ANSWER _____

6 Solve $(x-8)/(x+2) = 5$.

ANSWER _____

APPLY IT Show your work

- 1** A game update is 48 GB. Its download time, in hours, is $48/x$, where x is the download speed in GB per hour. What download speed is needed to finish the update in 6 hours?

WORK SPACE

ANSWER _____

- 2** A student club's cost per person, y , is modeled by $y = 96/x + 4$, where x is the number of students sharing the cost. How many students are sharing the cost if each student pays \$10?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Solve $x/(x+5) = 4/(x-4)$. State any excluded values and explain why neither solution is excluded.

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Solve $8/(x-4) = 2$.	$x = 8$
2	Solve $(x+6)/(x-5) = 2$.	$x = 16$
3	Solve $1/(x+4) + 1/(x-4) = 1/2$.	$x = 2 - 2\sqrt{5}$ or $x = 2 + 2\sqrt{5}$
4	Sketch $y = 6/(x+2) - 4$. State the vertical asymptote, horizontal asymptote, and two points on the graph.	Vertical asymptote: $x = -2$. Horizontal asymptote: $y = -4$. Sample points: $(0,-1)$ and $(1,-2)$.
5	Sketch $y = -8/(x-1) + 5$. State the vertical asymptote, horizontal asymptote, and two points on the graph.	Vertical asymptote: $x = 1$. Horizontal asymptote: $y = 5$. Sample points: $(-7,6)$ and $(0,13)$.
6	Solve $(x-8)/(x+2) = 5$.	$x = -9/2$

PART 2 · APPLY IT

- $x = 8$ GB per hour** Set $48/x = 6$. Multiply by x , then divide 48 by 6.
- $x = 16$ students** Substitute 10 for y : $10 = 96/x + 4$. Subtract 4, then solve $96/x = 6$.

CHALLENGE

Excluded values: $x = -5$ and $x = 4$. Solutions: $x = -2$ or $x = 10$. Neither solution makes a denominator zero.

Accept equivalent exact radical forms for Problem 3, such as $2 \pm 2\sqrt{5}$. For the graph items, accept any two correct points on the function along with the stated asymptotes.