

Rational Expressions and Equations Step by Step

Grade 11 – Algebra 2 math · Test Answer Key · Standards: A-APR.D.6, A-APR.D.7, A-REI.A.2

Each solution shows the factoring, the common denominator, and the check where required. Give partial credit for a correct method with an algebra slip, and no credit for an answer that keeps an extraneous solution.

Standards: A-APR.D.6, A-APR.D.7, A-REI.A.2 · **Level:** Grade 11 Algebra 2

Question 1 Simplify with restrictions (2 points)

$$\frac{(x-7)(x+3)}{(x-7)(x+7)} = \frac{(x+3)}{(x+7)}, \text{ with } x \neq 7 \text{ and } x \neq -7.$$

Scoring: 1 point for the simplified expression, 1 point for both excluded values.

Question 2 Divide and simplify (3 points)

$$\text{Factor: } \frac{(x-2)(x-4)}{(x(x+1))} \cdot \frac{(x+1)}{(x-2)}.$$

$$\text{Cancel } x-2 \text{ and } x+1: \frac{(x-4)}{x}.$$

Scoring: 1 point for the reciprocal, 1 for factoring, 1 for the simplified answer.

Question 3 Subtract rational expressions (3 points)

$$\text{LCD} = (x+4)(x-6). \quad \frac{(5(x-6) - 3(x+4))}{((x+4)(x-6))} = \frac{(5x-30-3x-12)}{((x+4)(x-6))}.$$

$$\frac{(2x-42)}{((x+4)(x-6))} \text{ or } \frac{(2(x-21))}{((x+4)(x-6))}$$

Scoring: 1 point for the LCD, 1 for the numerators, 1 for the result.

Question 4 Solve a rational equation (3 points)

Multiply by $x(x+6)$: $2(x+6) + 5x = x(x+6)$, so $7x+12 = x^2+6x$ and $x^2-x-12=0$.

$(x-4)(x+3)=0$ gives $x=4$ or $x=-3$. Neither is 0 or -6 .

$x=4$ or $x=-3$

Scoring: 1 point for the cleared equation, 1 for solving, 1 for the check.

Question 5 Extraneous solution (2 points)

Multiply by $x - 6$: $x = 3(x - 6) + 6 = 3x - 12$, so $x = 6$.

$x = 6$ makes the denominator 0, so it is extraneous.

No solution

Scoring: 1 point for the candidate $x = 6$, 1 point for rejecting it.

Question 6 Working together (3 points)

Rosa: $\frac{1}{12}$ per hour; Theo: $\frac{1}{20}$ per hour. Together $\frac{5}{60} + \frac{3}{60} = \frac{8}{60} = \frac{2}{15}$ per hour.

Time = $\frac{15}{2} = 7.5$ hours.

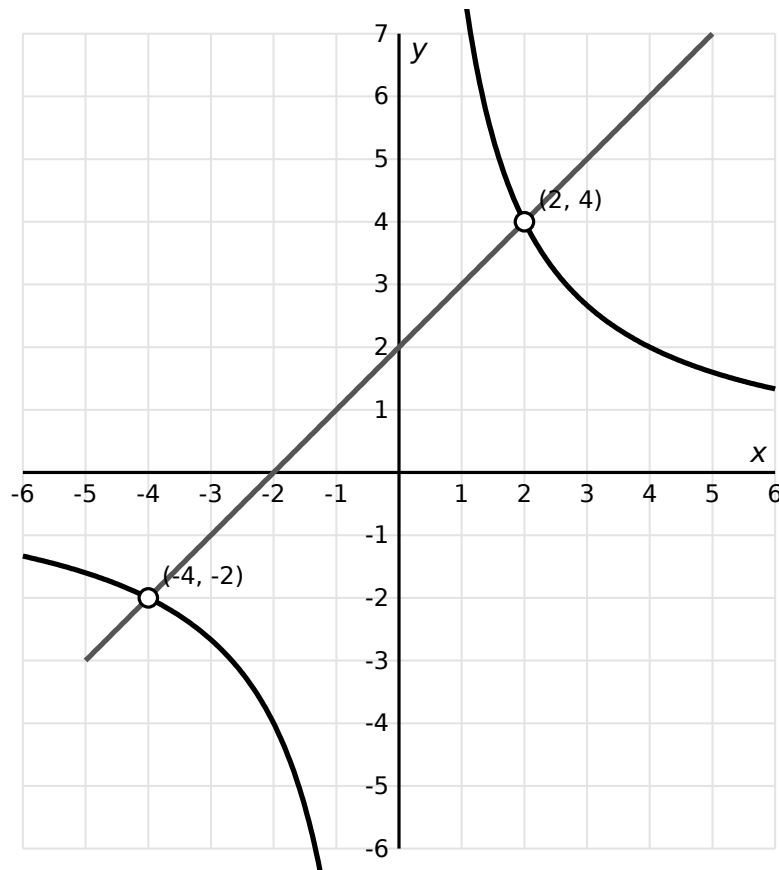
7.5 hours

Scoring: 1 point for the rates, 1 for the sum, 1 for the time.

Question 7 Solutions from a graph (2 points)

a) The graphs cross at $(2, 4)$ and $(-4, -2)$, so **$x = 2$ and $x = -4$** .

b) For $x = 2$: $8/2 = 4$ and $2 + 2 = 4$ ✓.



Intersections.

Scoring: 1 point each part.

Question 8 Writing from excluded values (2 points)

The denominator must be 0 exactly at $x = -3$ and $x = 4$, so it has factors $x + 3$ and $x - 4$.

$$\frac{1}{(x + 3)(x - 4)}$$

Scoring: 1 point for each correct factor.