

Algebra 2 · Rational Expressions and Equations

· Test Answer Key

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

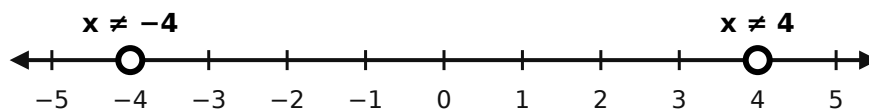
This answer key gives a worked solution and a scoring guide for each of the 8 questions. Award points as listed, and give partial credit when the method is correct but a sign or arithmetic slip appears.

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

Question 1: Simplify and restrict (2 points)

$\frac{(x-4)(x+3)}{(x-4)(x+4)} = \frac{x+3}{x+4}$. The original denominator is $(x-4)(x+4)$, so $x \neq 4$ and $x \neq -4$.

$$\frac{x+3}{x+4}, x \neq \pm 4$$



The excluded values are -4 and 4 .

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

Question 2: Divide rational expressions (2 points)

Multiply by the reciprocal: $\frac{(x-5)(x+5)}{x(x+2)} \cdot \frac{x+2}{x+5} = \frac{x-5}{x}$. Excluded values: $x \neq 0, -2, -5$.

$$\frac{x-5}{x}, x \neq 0, -2, -5$$

Scoring: 1 point for factoring and using the reciprocal, 1 point for the simplified result with the excluded values.

Question 3: Add and subtract (3 points)

a) LCD $(x+2)(x-1)$: $\frac{3(x-1)+4(x+2)}{(x+2)(x-1)} = \frac{3x-3+4x+8}{(x+2)(x-1)} = \frac{7x+5}{(x+2)(x-1)}$.

b) LCD $x^2-4 = (x-2)(x+2)$: $\frac{x-2(x+2)}{(x-2)(x+2)} = \frac{x-2x-4}{(x-2)(x+2)} = \frac{-x-4}{(x-2)(x+2)}$.

a) $\frac{7x+5}{(x+2)(x-1)}$ b) $\frac{-(x+4)}{(x-2)(x+2)}$

Scoring: part a, 1 point. Part b, 1 point for the correct LCD and rewriting, 1 point for the correct numerator.

Question 4: Rewrite a rational expression (2 points)

Divide: $x^2 \div x = x$; subtract $x^2 + 2x$ to get $3x + 1$; $3x \div x = 3$; subtract $3x + 6$ to get -5 .

$$x + 3 - \frac{5}{x+2}$$

Scoring: 1 point for the quotient $x+3$, 1 point for the remainder term $-\frac{5}{x+2}$.

Question 5: Solve and check (3 points)

a) Multiply by $x-4$: $x^2 = 3x+4$, so $x^2 - 3x - 4 = 0$ and $(x-4)(x+1) = 0$. Then $x = 4$ or $x = -1$.

b) At $x = 4$ the denominators are 0, so $x = 4$ is extraneous. Check $x = -1$: $\frac{1}{-5} = \frac{-3+4}{-5} = \frac{1}{-5}$.

a) $x = 4$ or $x = -1$ b) $x = 4$ is extraneous; the solution is $x = -1$

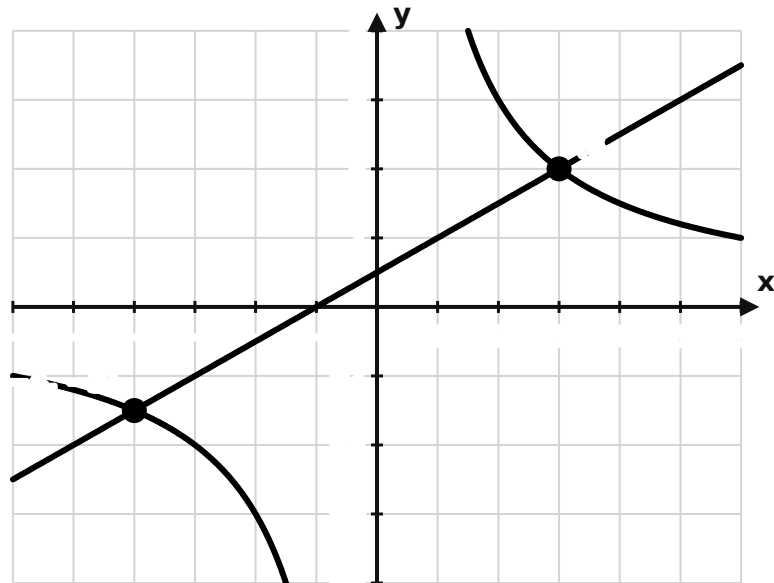
Scoring: part a, 1 point for $x^2 - 3x - 4 = 0$ and 1 point for both values. Part b, 1 point.

Question 6: Equation and graph (2 points)

a) Multiply by x : $12 = x^2 + x$, so $x^2 + x - 12 = 0$ and $(x+4)(x-3) = 0$. Then $x = -4$ or $x = 3$. Both are allowed because neither is 0.

b) At $x = 3$, $y = 4$. At $x = -4$, $y = -3$.

a) $x = -4$ or $x = 3$ b) $(3, 4)$ and $(-4, -3)$



The graphs meet at $(3,4)$ and $(-4,-3)$.

Scoring: 1 point for each part.

Question 7: Washing the vans (3 points)

a) Diego does $\frac{1}{10}$ of the job per hour and Liam does $\frac{1}{15}$. Together $\frac{1}{10} + \frac{1}{15} = \frac{1}{6}$.

b) Multiply by $30t$: $3t + 2t = 30$, so $5t = 30$ and $t = 6$. Check: $\frac{6}{10} + \frac{6}{15} = \frac{3}{5} + \frac{2}{5} = 1$.

a) $\frac{1}{10} + \frac{1}{15} = \frac{1}{6}$ b) 6 hours

Diego	Liam
$\frac{3}{5}$	$\frac{2}{5}$
0	whole job

In 6 hours: Diego $\frac{6}{10} = \frac{3}{5}$, Liam $\frac{6}{15} = \frac{2}{5}$.

Scoring: part a, 1 point. Part b, 1 point for clearing denominators correctly and 1 point for the answer.

Question 8: Road trip (3 points)

a) $\frac{120}{r} + \frac{60}{r-20} = 3.5$.

b) Multiply by $2r(r-20)$: $240(r-20) + 120r = 7r(r-20)$, so $360r - 4800 = 7r^2 - 140r$. Then $7r^2 - 500r + 4800 = 0$, which factors as $(r-60)(7r-80) = 0$.

So $r = 60$ or $r = \frac{80}{7} \approx 11.4$. The town speed $r - 20$ must be positive, so $\frac{80}{7}$ is rejected. Check $r = 60$: $\frac{120}{60} + \frac{60}{40} = 2 + 1.5 = 3.5$.

a) $\frac{120}{r} + \frac{60}{r-20} = 3.5$ **b)** $r = 60$ **mph**

Scoring: part a, 1 point. Part b, 1 point for the quadratic and 1 point for $r = 60$ with the other root rejected.

Total
20 points