**Sets & Steps**
Math Practice & Worked Solutions

## AP Precalculus

# Rational Expression Operations and Restrictions

Rational Expression Operations and Restrictions | APPC-U01-P14

96 problems · Four activity formats



**Topic focus**

Across 96 tasks this topic asks for recommended representation with preserved domain, function equality and exact agreement domain, verified original ratio and exact exclusion set, correct rewrite, exclusion, and test-input evidence, simplified rule plus every original exclusion and single ratio, reduced rule, and sourced exclusions.

**8 PDFs and a README; 55 buyer pages.**

The following pages use the same questions, given data, and notation as the final files. Question/card serial numbers and internal IDs are omitted in this preview only. Table values and matching responses are retained. Full answer keys are not included.


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## AP Precalculus

# Rational Expression Operations and Restrictions

**Name:** ______________ **Date:** ______________ **Class:** ______________

Answer each question and record the matching bank letter. Give exact values. Give the whole requested response, including any reasoning the question asks for.

| | |
|---|---|
| Rewrite $R(x) = \frac{(x+2)(x-6)(2x+3)}{(x+2)(x-6)(x-2)}$ in reduced form and state its original domain. Cancel only common nonzero factors; do not restore an input merely because it disappears from the denominator.<br><br>Bank label: ______ | Choose the more useful of the two supplied forms to determine the horizontal asymptote and the nonzero remainder in a quotient-remainder form. A (single ratio): $\frac{-3(x+2)+1}{x+2}$; $B$ (supplied quotient-remainder): $-3 + \frac{1}{x+2}$. State the feature, explain why that form exposes it, and retain every original excluded input.<br><br>Bank label: ______ |
| Rewrite $R(x) = 6(x+1)\frac{x-5}{(x+1)(x-5)}$ in reduced form and state its original domain. Cancel only common nonzero factors; do not restore an input merely because it disappears from the denominator.<br><br>Bank label: ______ | Determine all real $k$ for which $\frac{x+k}{x-7}$ and $\frac{x+2}{x-7}$ define identical functions. First compare the algebraic identity, then check zero denominators and whether the domains coincide.<br><br>Bank label: ______ |
| Rewrite $R(x) = 5(x+7)\frac{x+1}{(x+7)(x+1)}$ in reduced form and state its original domain. Cancel only common nonzero factors; do not restore an input merely because it disappears from the denominator.<br><br>Bank label: ______ | Determine all real $k$ for which $\frac{(x+2)(x+k)}{(x+2)(x-3)}$ and $\frac{x+k}{x-3}$ define identical functions. First compare the algebraic identity, then check zero denominators and whether the domains coincide.<br><br>Bank label: ______ |
| Rewrite $R(x) = 4(x-2)\frac{x-8}{(x-2)(x-8)}$ in reduced form and state its original domain. Cancel only common nonzero factors; do not restore an input merely because it disappears from the denominator.<br><br>Bank label: ______ | Choose the more useful of the two supplied forms to determine the horizontal asymptote and the nonzero remainder in a quotient-remainder form. A (single ratio): $\frac{3(x+5)+3}{x+5}$; $B$ (supplied quotient-remainder): $3 + \frac{3}{x+5}$. State the feature, explain why that form exposes it, and retain every original excluded input.<br><br>Bank label: ______ |

## AP Precalculus

# Rational Expression Operations and Restrictions

**Name:** ______________ **Date:** ______________ **Class:** ______________

Answer each question and show your reasoning in the workspace. Give exact values rather than decimals unless the question supplies a decimal. Give the whole requested response, including any reasoning the question asks for.

| | |
|---|---|
| Construct an original rational ratio that reduces to $x - 1$ but has requested original exclusions $\{x = -1\}$. The reduced rule already excludes none; do not add redundant common factors or unintended restrictions. | Rewrite $(\frac{x+7}{x+4}) \div (\frac{x-3}{x})$ as one rational expression and state the domain. Track every component denominator before simplifying; for division, also exclude inputs where the divisor equals zero. |
| Rewrite $R(x) = \frac{(x+8)x(2x-3)}{(x+8)x(x+2)}$ in reduced form and state its original domain. Cancel only common nonzero factors; do not restore an input merely because it disappears from the denominator. | Given $f(x) = \frac{(x+6)(2x-3)}{(x+6)(x+1)}$ with excluded inputs $-6, -1$, and $g(x) = \frac{2x-3}{x+1}$ with $x \neq -6, -1$ with excluded inputs $-6, -1$. Decide whether they are identical functions and state exactly where their values agree. A matching simplified formula is not sufficient without matching domains. |
| Construct an original rational ratio that reduces to $x - 2$ but has requested original exclusions $\{x = -7\}$. The reduced rule already excludes none; do not add redundant common factors or unintended restrictions. | Rewrite $(\frac{x+5}{x+2})(\frac{x+2}{x-2})$ as one rational expression and state the domain. Track every component denominator before simplifying; for division, also exclude inputs where the divisor equals zero. |

## AP Precalculus

# Rational Expression Operations and Restrictions

**Name:** ______________________ **Date:** ______________________ **Class:** ______________________

Begin at START. Answer the card, then find the matching final answer at the top of another card. Use the recording sheet for your reasoning. Visit each card once and continue to FINISH.

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**START**

Rewrite $\left(\frac{x-2}{x-5}\right) \div \left(\frac{x-12}{x-9}\right)$ as one rational expression and state the domain. Track every component denominator before simplifying; for division, also exclude inputs where the divisor equals zero.

Your response: ______________________

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**Incoming:** The single ratio is $\frac{(x-2)(x-9)}{(x-5)(x-12)}$, reducing to $\frac{(x-2)(x-9)}{(x-5)(x-12)}$, with all real $x$ except $x = 5, x = 9, x = 12$.

Determine all real $k$ for which $\frac{x+k}{x+2}$ and $\frac{x}{x+2}$ define identical functions. First compare the algebraic identity, then check zero denominators and whether the domains coincide.

Your response: ______________________

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**Incoming:** k = 0.

Rewrite $\left(\frac{x+10}{x+7}\right) \div \left(\frac{x}{x+3}\right)$ as one rational expression and state the domain. Track every component denominator before simplifying; for division, also exclude inputs where the divisor equals zero.

Your response: ______________________

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**Incoming:** The single ratio is $\frac{(x+10)(x+3)}{(x+7)x}$, reducing to $\frac{(x+10)(x+3)}{(x+7)x}$, with all real $x$ except $x = -7, x = -3, x = 0$.

Construct an original rational ratio that reduces to $\frac{3x-2}{x+6}$ but has requested original exclusions $\{x = -6, x = -2\}$. The reduced rule already excludes $\{x = -6\}$; do not add redundant common factors or unintended restrictions.

Your response: ______________________

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**Incoming:** One valid predecessor is $\frac{(x+2)(3x-2)}{(x+2)(x+6)}$, with all real $x$ except $x = -6, x = -2$.

Rewrite $\left(\frac{x+3}{x}\right) + \left(\frac{4}{x}\right)$ as one rational expression and state the domain. Track every component denominator before simplifying; for division, also exclude inputs where the divisor equals zero.

Your response: ______________________

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**Incoming:** The single ratio is $\frac{x+7}{x}$, reducing to $\frac{x+7}{x}$, with all real $x$ except $x = 0$.

Choose the more useful of the two supplied forms to determine the horizontal asymptote and the nonzero remainder in a quotient-remainder form. A (single ratio): $\frac{-2(x-6)+4}{x-6}$; $B$ (supplied quotient-remainder): $-2 + \frac{4}{x-6}$. State the feature, explain why that form exposes it, and retain every original excluded input.

Your response: ______________________

**AP Precalculus**

# Rational Expression Operations and Restrictions

**Name:** ______________________ **Date:** ______________________ **Class:** ______________________

Evaluate the supplied statement or method. Say whether it is correct, repair it if it is not, and verify the result exactly. Not every prompt contains an error.

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A student rewrites $(x-3)\,\frac{x+2}{x-3}$ as $x+2$ for every real $x$. Identify the first invalid inference. State the corrected rule and its original domain, then test the designated input when it is allowed.

Designated test input: $x = 3$.

---

A student rewrites $\frac{x-1}{x-4}$ as $-\frac{1}{-4}$. Identify the first invalid inference. State the corrected rule and its original domain, then test the designated input when it is allowed.

Designated test input: $x = 1$.

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A student rewrites $(x+3)\,\frac{x+2}{x+3}$ as $x+2$ for every real $x$. Identify the first invalid inference. State the corrected rule and its original domain, then test the designated input when it is allowed.

Designated test input: $x = -3$.

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A student rewrites $\frac{4-x}{x-4}$ as $1$. Identify the first invalid inference. State the corrected rule and its original domain, then test the designated input when it is allowed.

Designated test input: $x = 5$.

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# Rational Expression Operations and Restrictions

## Full Worked Solutions - excerpt

### Worked example

**Problem.** Rewrite $(\frac{x+3}{x}) + (\frac{4}{x})$ as one rational expression and state the domain. Track every component denominator before simplifying; for division, also exclude inputs where the divisor equals zero.

**Answer.** The single ratio is $\frac{x+7}{x}$, reducing to $\frac{x+7}{x}$, with all real $x$ except $x = 0$.

### Explanation and check.

Combining the operation gives $\frac{x+7}{x}$. The common denominator supplies the sole restriction. Therefore the complete exclusion set is $0$.

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### Worked example

**Problem.** Rewrite $(\frac{x-9}{x-12}) + (\frac{6}{x-12})$ as one rational expression and state the domain. Track every component denominator before simplifying; for division, also exclude inputs where the divisor equals zero.

**Answer.** The single ratio is $\frac{x-3}{x-12}$, reducing to $\frac{x-3}{x-12}$, with all real $x$ except $x = 12$.

### Explanation and check.

Combining the operation gives $\frac{x-3}{x-12}$. The common denominator supplies the sole restriction. Therefore the complete exclusion set is $12$.