Sets & Steps
Math Practice & Worked Solutions

AP Precalculus

Inverse Matrices and Linear Systems

Inverse Matrices and Linear Systems | APPC-U04-P16

96 problems · Four activity formats

Topic focus

Across 96 tasks this topic asks for values in example and valid general conclusion, conclusion and valid multiplication side, corrected table and verdict, valid and invalid cases, invertible and singular lists and decision and determinant evidence.

8 PDFs and a README; 70 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

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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.

Find the inverse by undoing the two independent coordinate scalings.

Solve the problem, then match the entire requested response to one unused entry in the Answer Bank.

2	0
0	5

Bank label: _____

Treat the two right-hand sides as columns of one table and use the same inverse once to solve both systems.

Solve the problem, then match the entire requested response to one unused entry in the Answer Bank.

Coefficient matrix

2	1
1	1

Right-hand-side column 1

5
3

Right-hand-side column 2

1
−1

Supplied inverse

1	−1
−1	2

Bank label: _____

Use the bottom-right identity entry to find q.

Solve the problem, then match the entire requested response to one unused entry in the Answer Bank.

4	0
0	−2

$\frac{1}{4}$	0
0	q

Bank label: _____

Find the inverse of the three-factor expression $AB{A}^{-1}$ and verify the result without commuting A and B.

Bank label: _____

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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.

Use the supplied inverse rather than elimination, then substitute the result into both original equations.

Show a complete response in the numbered workspace, preserving requested exactness, units, interval endpoints, and justification.

Coefficient matrix

3	1
1	1

Right-hand-side column

8
4

Supplied inverse

$\frac{1}{2}$	$-\frac{1}{2}$
$-\frac{1}{2}$	$\frac{3}{2}$

Compute the exact inverse, preserving the sign of the determinant throughout the scalar division.

Show a complete response in the numbered workspace, preserving requested exactness, units, interval endpoints, and justification.

1	3
2	4

Test the candidate and determine whether a row-column transposition caused the failure.

Show a complete response in the numbered workspace, preserving requested exactness, units, interval endpoints, and justification.

Proposed inverse

3	−2
−1	1

Given matrix

1	1
2	3

Find the inverse with a single common denominator and verify one diagonal product entry.

Show a complete response in the numbered workspace, preserving requested exactness, units, interval endpoints, and justification.

4	3
1	2

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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.

Incoming: The determinant is $k^2 + 1$, which is positive for every real k. Every matrix in the family is invertible.

Square the matrix to determine whether using the original matrix as its own inverse is valid.

Solve the card, use the complete requested response as the outgoing match, and move to the unique card whose incoming header matches it; continue until FINISH.

1	0
2	-1

1	0
2	-1

Your response: _____

START

Verify algebraically whether the proposed matrix is an inverse for every real k, rather than checking sample values.

Solve the card, use the complete requested response as the outgoing match, and move to the unique card whose incoming header matches it; continue until FINISH.

1	-1
1-k	k

k	1
$k-1$	1

Your response: _____

Incoming: The determinant is $8k - 8 = 8(k - 1)$. Only $k = 1$ is singular; $k = -2, -1, 0, 2, 3$ give invertible matrices.

Use the bottom-right identity constraint to find q.

Solve the card, use the complete requested response as the outgoing match, and move to the unique card whose incoming header matches it; continue until FINISH.

1	2
2	5

5	-2
-2	q

Your response: _____

Incoming: The inverse is $[[\frac{1}{3}, -\frac{5}{6}], [0, \frac{1}{2}]]$.

Use A's inverse to determine what follows from BA=CA, making the cancellation on the correct side.

Your response: _____

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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.

A student claims: “The proposed matrix cannot be an inverse because its off-diagonal entries are nonzero.” Diagnose the first invalid step or assumption, give the corrected conclusion, and justify the correction. Then complete or verify the underlying task: Multiply the matrix by the proposed inverse and decide whether the proposal satisfies the defining identity relation.

Identify the stated incorrect claim or first invalid step, give the corrected result, and state a brief mathematical reason.

1	-1
-1	2

2	1
1	1

Recompute the product instead of trusting the student’s table. Decide whether the error lies in the candidate or in the verification arithmetic.

Identify the error or first invalid step, give the corrected result, and state a brief mathematical reason.

$\frac{1}{3}$	$-\frac{1}{3}$
$\frac{1}{3}$	$\frac{2}{3}$

2	1
-1	1

1	0
1	1

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Full Worked Solutions - excerpt

Worked example

Problem. Find the inverse of the three-factor expression AB A^{-1} and verify the result without commuting A and B.

Answer. The inverse is A B^{-1} A^{-1}. Multiplication gives A B A^{-1} A B^{-1} A^{-1} =I after adjacent cancellations.

Explanation and check.

Reverse all three factors and invert each one; the inverse of A inverse is A itself.

Worked example

Problem. Use A's inverse to determine what follows from BA=CA, making the cancellation on the correct side.

Answer. Multiplying both sides on the right by A^{-1} gives $B = C$.

Explanation and check.

The common factor is on the right, so its inverse must also be placed on the right to cancel it.