

Precalculus
Implicit & Parametric Conic Sections | 3-Topic Precalculus Bundle

3-topic bundle | 288 problems | Four activity formats

01 Implicit Relations and Curves

[View individual product and its full preview](#)

02 Conic Sections from Equations and Data

[View individual product and its full preview](#)

03 Parametric Conic Sections

[View individual product and its full preview](#)

In every topic

Answer Bank Challenge	24 tasks
Grid Rounds	24 tasks
Match & Move	24 cards
Error Analysis & Strategy	24 tasks
Quick Answer Key and Full Worked Solutions	included
Teacher / Parent Use Guide and Terms of Use	included

Product previews

The following preview pages show the cover, all four activity formats, and worked examples for each included resource, in the listed order.

24 PDFs and 3 READMEs; 311 buyer PDF pages across the 3 products.

Preview pages are not included in the buyer page count. Check the list against resources you already own.

This is a fixed collection of the listed products. Purchase includes the existing individual resource files. To open a product's online preview, follow its title link and select View Preview.

AP Precalculus

Implicit Relations and Curves

Implicit Relations and Curves | APPC-U04-P07

96 problems · Four activity formats

01	Answer Bank Challenge	24 tasks
02	Grid Rounds	24 tasks
03	Match & Move	24 cards
04	Error Analysis & Strategy	24 tasks
05	Quick Answer Key	96 answers
06	Full Worked Solutions	96 solutions
07	Teacher / Parent Use Guide	included
08	Terms of Use & License	included

Topic focus

Across 96 tasks this topic asks for consistency judgment, possible entries, member set, invalid row, inequality and rule and restriction, rule, y-domain.

8 PDFs and a README; 104 buyer pages.

AP Precalculus

Implicit Relations and Curves

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.

Exactly one row misses the relation. Which one?

Given: domain: x, y real; relation: $(x - 2)(y + 1) = 6$; rows: $(5, 1)$; $(-1, -3)$; $(4, 2)$; $(3, 4)$

Required response

x	y
5	1
-1	-3
4	2
3	4

Bank label: _____

Identify every coordinate pair that satisfies the scaled relation.

Given: domain: x, y real; relation: $\frac{x^2}{4} + \frac{y^2}{9} = 1$; rows: $(0, 3)$; $(2, 0)$; $(1, 2)$; $(\sqrt{2}, 3\frac{\sqrt{2}}{2})$

Required response

x	y
0	3
2	0
1	2
$\sqrt{2}$	$3\frac{\sqrt{2}}{2}$

Bank label: _____

How many rows lie on the relation, and which are they?

Given: domain: x, y real; relation: $2x - y = 5$; rows: $(3, 1)$; $(\frac{7}{2}, 2)$; $(\frac{1}{2}, -4)$; $(-1, -7)$

Required response

x	y
3	1
$\frac{7}{2}$	2
$\frac{1}{2}$	-4
-1	-7

Bank label: _____

Mark the valid rows, then explain what they show about y -values at $x = 10$.

Given: domain: x, y real; relation: $y^2 = x - 1$; rows: $(x: 10; y: 3)$; $(x: 10; y: -3)$; $(x: 10; y: 0)$

Required response

x	y
10	3
10	-3
10	0

Bank label: _____

AP Precalculus

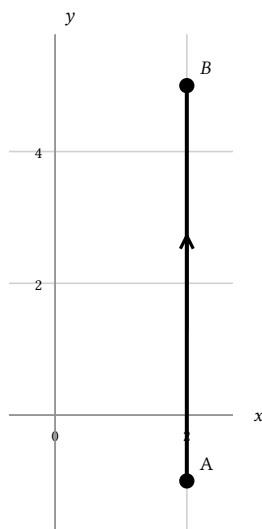
Implicit Relations and Curves

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.

Describe both coordinate changes along the arrow.

Given graph



A: $(2, -1)$

B: $(2, 5)$

AP Precalculus

Implicit Relations
and Curves

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.

START Write every real y-branch and state the x-values for which it exists. Given: domain: x, y real; isolated variable: y; relation: $y^2 = 4 - x$ Your response: _____	Incoming: $y = \sqrt{4 - x}$ or $y = -\sqrt{4 - x}$, with $x \leq 4$. Express the relation as a rule with x as input. Given: domain: x, y real; isolated variable: y; relation: $2x + 3y = 12$ Your response: _____
Incoming: $y = 4 - (\frac{2}{3})x$ for every real x. List every relation point with the prescribed first coordinate. Given: domain: x, y real; input x: 3; relation: $y^2 = 12 - x$ Your response: _____	Incoming: $(3, 3)$ and $(3, -3)$. Determine whether the relation has any real point above this x-value. Given: domain: x, y real; input x: 3; relation: $(y - 1)^2 = x - 4$ Your response: _____
Incoming: It has none. Solve for x, keeping every real branch and the output-variable domain. Given: domain: x, y real; isolated variable: x; relation: $(x - 2)^2 = y + 1$ Your response: _____	Incoming: $x = 2 + \sqrt{y + 1}$ or $x = 2 - \sqrt{y + 1}$, for $y \geq -1$. Make y explicit and state the excluded vertical line. Given: domain: x, y real; isolated variable: y; relation: $(x + 3)(y - 2) = 4$ Your response: _____

AP Precalculus

Implicit Relations and Curves

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.

Which proposed points belong to the relation?

Given: candidates: $(5, 3)$; $(5, -3)$; $(5, 1)$; domain: x, y real; relation: $y^2 = x + 4$

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

x	y
5	3
5	-3
5	1

A student claims: "All four listed rows satisfy $x^2 - y = 3$." Diagnose the first invalid step or assumption, give the corrected conclusion, and justify the correction. Then complete the stated task: Three rows satisfy the relation. Identify the one that does not.

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

x	y
-1	-2
0	-3
2	1
3	5

Implicit Relations and Curves

Full Worked Solutions - excerpt

Worked example

Problem. Determine whether the relation has any real point above this x -value.

Given: domain: x, y real; input $x: 3$; relation: $(y - 1)^2 = x - 4$

Answer. It has none.

Explanation and check.

Substitution would make the square $(y - 1)^2$ equal -1 , impossible over the reals.

Worked example

Problem. Give a complete explicit description of the relation.

Given: domain: x, y real; relation: $y^2 = (x - 1)^2$

Answer. $y = x - 1$ or $y = 1 - x$, for every real x .

Explanation and check.

Equality of the squares means $y = \pm(x - 1)$; the two lines meet at $(1, 0)$.

AP Precalculus
Conic Sections from Equations and Data

Conic Sections from Equations and Data | APPC-U04-P08

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Topic focus
Across 96 tasks this topic asks for axis, direction, x-intercepts, vertex, axis, direction, sample point, exact points, normalized form, equation or contradiction and equation or impossibility.
8 PDFs and a README; 158 buyer pages.

AP Precalculus

Conic Sections from Equations and Data

Name: _____ Date: _____ Class: _____

Answer each question and record the matching bank letter. Give exact values. A value without its unit is not a complete answer.

Use the two labeled rows to determine the vertex-form coefficient. Required response <table><tr><td>role</td><td>x</td><td>y</td></tr><tr><td>vertex</td><td>1</td><td>-2</td></tr><tr><td>curve point</td><td>3</td><td>6</td></tr></table> _____ Bank label: _____	role	x	y	vertex	1	-2	curve point	3	6	Normalize the equation and determine whether any real point remains. domain: x, y real; equation: $x^2 + y^2 - 4x + 2y + 9 = 0$. _____ Bank label: _____
role	x	y								
vertex	1	-2								
curve point	3	6								

AP Precalculus

Conic Sections from Equations and Data

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. A value without its unit is not a complete answer.

List the graph-defining features of the hyperbola. domain: x, y real; equation: $\frac{x^2}{9} - \frac{y^2}{16} = 1$.

AP Precalculus

**Conic Sections from
Equations and Data**

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.

Find the constant error in the work and repair the conic description. domain: x, y real; equation:

$4x^2 - 16x + y^2 + 6y - 11 = 0$; student work: $4(x - 2)^2 + (y + 3)^2 = 20$. Identify the error or first invalid step, give the corrected result, and state a brief mathematical reason.

A student claims: “The focus $(0, 2)$ gives $p = 1$, so the equation is $x^2 = 4y$ and $(4, 2)$ is not on the parabola.” Diagnose the first invalid step or assumption, give the corrected conclusion, and justify the correction. Then complete or verify the underlying task: Build the focal equation and test the proposed point. candidate point: $4, 2$; domain: vertical parabola; focus: $0, 2$; rule: $x^2 = 4py$; student claim: The focus $(0, 2)$ gives $p = 1$, so the equation is $x^2 = 4y$ and $(4, 2)$ is not on the parabola.; vertex: $0, 0$. Identify the stated incorrect claim or first invalid step, give the corrected result, and state a brief mathematical reason.

Conic Sections from Equations and Data

Full Worked Solutions - excerpt

Worked example

Problem. State the two defining geometric features. domain: x, y real; equation: $x^2 + y^2 = 81$.

Answer. Center $(0, 0)$, radius 9.

Explanation and check.

The equation is a sum of squared displacements equal to 9^2 .

Worked example

Problem. Write the exact equation without converting the radius to a decimal. center: $-3, 1$; domain: circle; radius: $\sqrt{11}$.

Answer. $(x + 3)^2 + (y - 1)^2 = 11$.

Explanation and check.

Coordinate differences measure displacement from $(-3, 1)$, and the equation uses radius squared.

AP Precalculus

Parametric Conic Sections

Parametric Conic Sections | APPC-U04-P09

96 problems · Four activity formats

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Topic focus

Across 96 tasks this topic asks for coverage and orientation, image, number of traversals, start visits, coverage, start, direction, branches and parameter pieces, parametric pair and parametric pair and domain.

8 PDFs and a README; 49 buyer pages.

AP Precalculus

Parametric Conic Sections

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.

Parametrize one counterclockwise traversal from the stated start. direction: counterclockwise; domain: $0 \leq t \leq 2\pi$; equation: $\frac{(x-2)^2}{25} + \frac{(y+1)^2}{9} = 1$; start: rightmost point. _____ Bank label: _____	Parametrize only the component above the center. desired: upper branch only; domain: $-\frac{\pi}{2} < t < \frac{\pi}{2}$; equation: $\frac{(y+3)^2}{25} - \frac{(x-2)^2}{4} = 1$. _____ Bank label: _____
Separate curve membership from traversal multiplicity. domain: $0 \leq t \leq 2\pi$; rules: $x: 5 \cos(2t)$; $y: 2 \sin(2t)$; target: $\frac{x^2}{25} + \frac{y^2}{4} = 1$. _____ Bank label: _____	Let the vertical coordinate be the free parameter. curve: $x = 3y - 5$; domain: y real. _____ Bank label: _____
The formulas are correct but reach only one branch on the student's domain. Repair only the domain so both branches are covered. desired: both complete branches; domain: student used $-\frac{\pi}{2} < t < \frac{\pi}{2}$; implicit curve: $\frac{x^2}{9} - \frac{y^2}{4} = 1$; rules: $x: 3 \sec t$; $y: 2 \tan t$. _____ Bank label: _____	Use a free horizontal parameter while retaining the branch endpoints. curve: $y = \sqrt{9-x^2}$; domain: $y \geq 0$; x interval: $-3 \leq x \leq 3$. _____ Bank label: _____
Use the supplied identity to parametrize the hyperbola. domain: $\cos t \neq 0$; equation: $x^2 - y^2 = 1$; identity: $\sec^2 t - \tan^2 t = 1$. _____ Bank label: _____	Trace the specified lower half exactly once. desired arc: left endpoint to right endpoint through bottom; domain: $\pi \leq t \leq 2\pi$; equation: $\frac{x^2}{36} + \frac{(y-1)^2}{4} = 1$. _____ Bank label: _____

AP Precalculus

Parametric Conic Sections

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.

Decide whether the pairs trace the same ellipse and relate their parameters. domain: $0 \leq \text{parameter} \leq 2\pi$; pair A: $x: 3 \cos t$; $y: 2 \sin t$; pair B: $x: 3 \cos u$; $y: -2 \sin u$. 	Trace only the component below the center. desired: lower branch; domain: $\frac{\pi}{2} < t < 3\frac{\pi}{2}$; equation: $\frac{(y+1)^2}{16} - \frac{(x-3)^2}{9} = 1$.
Determine whether the enlarged parameter interval changes the branch image. domain: $-\frac{\pi}{2} < \text{parameter} < \frac{\pi}{2}$; pair A: $x: 3 \sec t$; $y: 2 \tan t$; pair B: domain: $-\pi < u < \pi$; $x: 3 \sec(\frac{u}{2})$; $y: 2 \tan(\frac{u}{2})$. 	Parametrize only the specified quarter arc with both endpoints included. desired arc: from $(7, -2)$ to $(3, 1)$ in quadrant relative to center; domain: $0 \leq t \leq \frac{\pi}{2}$; equation: $\frac{(x-3)^2}{16} + \frac{(y+2)^2}{9} = 1$.
Use y as the free coordinate and preserve its forbidden value. curve: $x = \frac{y+2}{y-1}$; domain: $y \neq 1$. 	Describe the traversal produced by this nonstandard one-period interval. domain: $\frac{\pi}{2} \leq t \leq 5\frac{\pi}{2}$; rules: $x: 2 + 6 \cos t$; $y: 1 + 3 \sin t$; target: $\frac{(x-2)^2}{36} + \frac{(y-1)^2}{9} = 1$.

AP Precalculus

Parametric Conic Sections

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 first covers the whole parabola; the second covers only the upper half $y \geq 0$, with each nonvertex point reached by u and $-u$. Test the proposed assignment against the signed equation. candidate: $x: 3 \tan t; y: 4 \sec t$; domain: $\cos t \neq 0$; implicit curve: $\frac{x^2}{9} - \frac{y^2}{16} = 1$. Your response: _____	Incoming: The open arc with angles $\frac{\pi}{3} < t < 2\frac{\pi}{3}$ is omitted; both boundary points at angles $\frac{\pi}{3}$ and $2\frac{\pi}{3}$ are included. Identify the relative quadrant and endpoint membership. domain: $\frac{\pi}{2} < t < \pi$; rules: $x: 2 + 4 \cos t; y: -1 + 3 \sin t$; target: $\frac{(x-2)^2}{16} + \frac{(y+1)^2}{9} = 1$. Your response: _____
Incoming: $x = 3 + 7 \cos t, y = -2 - 4 \sin t, 0 \leq t \leq \pi$. Parametrize both branches across one trigonometric period. domain: $0 \leq t \leq 2\pi$ excluding poles; equation: $\frac{(x-1)^2}{9} - \frac{(y+4)^2}{4} = 1$. Your response: _____	Incoming: $x = -1 + 2 \cos t, y = 2 + 5 \sin t, 0 \leq t \leq \frac{\pi}{2}$. Give one rule that follows the specified right-bottom-left route without tracing the upper half. direction: clockwise; domain: half arc; end: $[-4, -2]$; implicit curve: $\frac{(x-3)^2}{49} + \frac{(y+2)^2}{16} = 1$; start: $[10, -2]$; via: $[3, -6]$. Your response: _____
Incoming: $x = 1 + 3 \sec t, y = -4 + 2 \tan t; 0 \leq t \leq 2\pi$ with $t \neq \frac{\pi}{2}, 3\frac{\pi}{2}$. Place secant on the coordinate with the positive normalized square. domain: $\cos t \neq 0$; equation: $\frac{y^2}{16} - \frac{x^2}{9} = 1$; identity: $\sec^2 t - \tan^2 t = 1$. Your response: _____	Incoming: Invalid; it gives $\tan^2 t - \sec^2 t = -1$ instead of 1. Use the horizontal coordinate while preserving the real-power branch. curve: $y = (x - 1)^{\frac{3}{2}}$; domain: $x \geq 1, y \geq 0$. Your response: _____

AP Precalculus

Parametric Conic Sections

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.

Change the minimum necessary component to fit the ellipse. domain: t real; student pair: $x: 5 \cos t$; $y: 5 \sin t$; target: $\frac{x^2}{25} + \frac{y^2}{9} = 1$.

Fix both the semiaxis error and the excessive trace domain. domain: $0 \leq t \leq 2\pi$; student domain: $0 \leq t \leq 2\pi$; student pair: $x: 1 + 4 \cos t$; $y: -2 + 2 \sin t$; target: $\frac{(x-1)^2}{25} + \frac{(y+2)^2}{4} = 1$, upper half only.

Decide whether the proposed pair remains on the ellipse for every parameter. candidate: $x: 3 \cos t$; $y: 3 \sin t$; domain: t real; implicit curve: $\frac{x^2}{9} + \frac{y^2}{4} = 1$.

The formulas lie on the ellipse, but the student's interval selects the wrong half. Change only the interval. desired: lower arc from left vertex to right vertex; domain: student used $0 \leq t \leq \pi$; implicit curve: $\frac{(x-1)^2}{25} + \frac{(y-2)^2}{4} = 1$; rules: $x: 1 + 5 \cos t$; $y: 2 + 2 \sin t$.

Parametric Conic Sections

Full Worked Solutions - excerpt

Worked example

Problem. Use a direct horizontal free parameter. curve: $y = -3x + 7$; domain: x real.

Answer. $x = t, y = -3t + 7$, for all real t .

Explanation and check.

Each real input is represented once and its output follows the explicit rule.

Worked example

Problem. Factor the relation and use the coordinate that keeps the formula simplest. curve: $xy + y = 4$; domain: $y \neq 0$.

Answer. $x = \frac{4}{t} - 1, y = t$, with $t \neq 0$.

Explanation and check.

The relation is $y(x + 1) = 4$, so choosing $y = t$ gives the stated reciprocal and excludes zero.