Sets & Steps
Math Practice & Worked Solutions

AP Precalculus
Parametric Conic Sections

Parametric Conic Sections | APPC-U04-P09

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 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.

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.

Published by Tusils LLC.

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.

Parametrize one counterclockwise traversal from the stated start. direction: counterclockwise; domain: $0 \le t \le 2\pi$; 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: $0 \le t \le 2\pi$; 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: $y \ge 0$; x interval: $-3 \le x \le 3$. Bank label: _______
Use the supplied identity to parametrize the hyperbola. domain: $\cos t \ne 0$; 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: $\pi \le t \le 2\pi$; equation: $\frac{x^2}{36} + \frac{(y-1)^2}{4} = 1$. Bank label: _______

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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: $0 \leq$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: -$\frac{\pi}{2}$ <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: $\frac{(x-2)^2}{36} + \frac{(y-1)^2}{9} = 1$.

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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: ____________________

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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.

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

Fix both the semiaxis error and the excessive trace domain. domain: $0\le t\le 2\pi$; student domain: $0\le t\le 2\pi$; student pair: $x\colon\ 1+4\cos t$; $y\colon\ -2+2\sin t$; 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: $x\colon\ 3\cos t$; $y\colon\ 3\sin t$; 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 $0\le t\le\pi$; implicit curve: $\frac{(x-1)^2}{25}+\frac{(y-2)^2}{4}=1$; rules: $x\colon$ $1+5\cos t$; $y\colon\ 2+2\sin t$.

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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.