

AP Precalculus
Polar Symmetry and Curve Tracing

Polar Symmetry and Curve Tracing | APPC-U03-P26

96 problems · Four activity formats

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Topic focus

Across 96 tasks this topic asks for sufficient interval and retrace explanation, symmetry conclusion, once-through subinterval and retrace explanation, pole and nonpole multiplicities, pole multiplicity and nonpole verdict and partial/full/retraced judgment.

8 PDFs and a README; 156 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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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.

On $r = 2 \sin(3\theta)$, show that $\theta = \frac{\pi}{6}$ and $\theta = 7\frac{\pi}{6}$ represent the same petal tip and give its Cartesian coordinates.
Solve the problem, then match the entire requested response to one unused entry in the Answer Bank.

Given θ	Given r
$\frac{\pi}{6}$	2
$7\frac{\pi}{6}$	-2

Condition or evidence	Supplied value
Original polar rule	$r = 2 \sin(3\theta)$
Given target point	distance 2 on ray $\frac{\pi}{6}$

Bank label: _____

How many times does $r = 2 + 2 \cos \theta$ visit the pole on $0 \leq \theta < 2\pi$? Distinguish that count from the closed-curve endpoint convention.
Solve the problem, then match the entire requested response to one unused entry in the Answer Bank.

Condition or evidence	Supplied value
Original polar rule	$r = 2 + 2 \cos \theta$
Given equation for zero radius	$\cos \theta = -1$

Bank label: _____

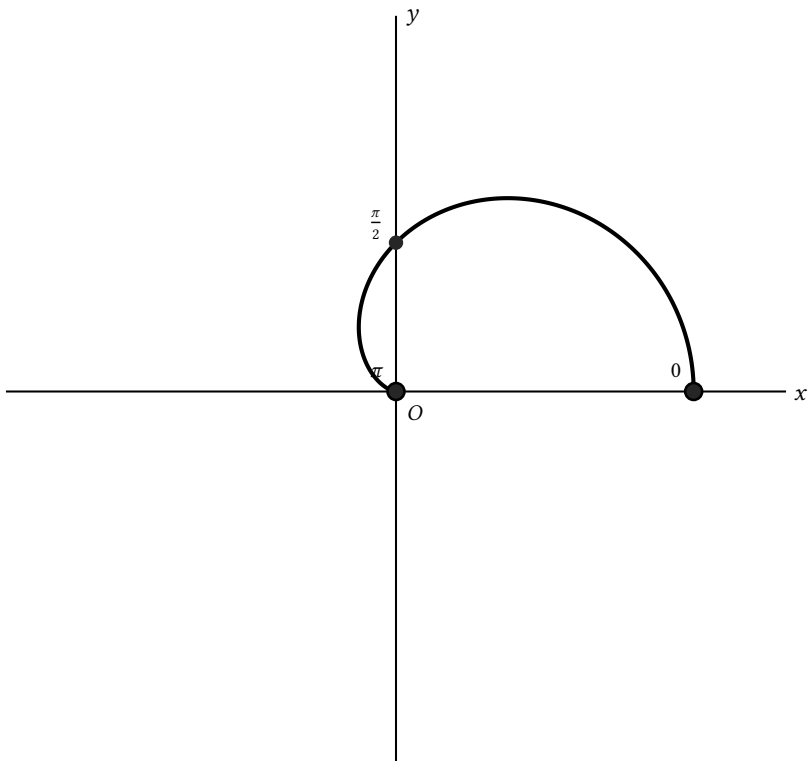
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Name: _____ Date: _____ Class: _____

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.

For $r = 1 + \cos \theta$ on $0 \leq \theta \leq \pi$, describe the direction of travel through the three labeled anchors as θ increases.



Given parameter	Given point or location
0	(2, 0)
$\frac{\pi}{2}$	(0, 1)
π	pole

Condition or evidence	Supplied value
Original polar rule	$r = 1 + \cos \theta$

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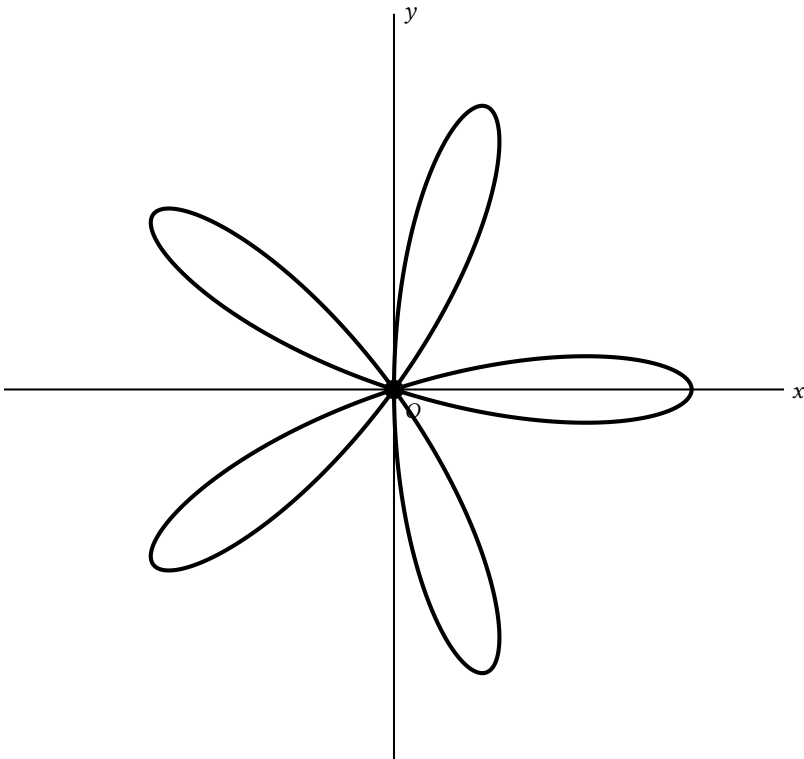
Polar Symmetry and Curve Tracing

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

Determine whether $-\frac{\pi}{2} \leq \theta \leq \frac{\pi}{2}$ is sufficient to trace every petal of $r = \cos(5\theta)$ once. Justify with a half-turn correspondence rather than a memorized rule.



Condition or evidence	Supplied value
Half turn relation	$r(\theta + \pi) = -r(\theta)$
Interval length	π
Original polar rule	$r = \cos(5\theta)$

Your response: _____

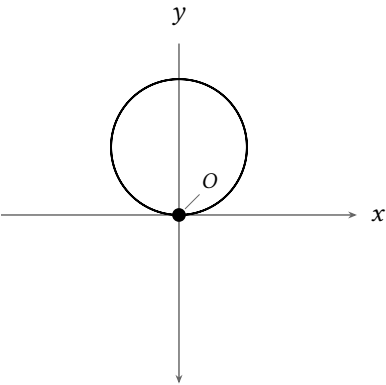
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Name: _____ Date: _____ Class: _____

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.

A student says $r = \sin \theta$ needs all of $[0, 2\pi]$ for one trace because $\sin \theta$ has period 2π . Repair the claim using signed-radius equivalence.



Condition or evidence	Supplied value
Half turn relation	$r(\theta + \pi) = -r(\theta)$
Original polar rule	$r = \sin \theta$
Student claim to examine	A full 2π parameter interval is required because the radius has period 2π .

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Full Worked Solutions - excerpt

Worked example

Problem. Which parameters repeat the closing point of $r = 4$ on the closed interval $0 \leq \theta \leq 2\pi$?

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

Condition or evidence	Supplied value
Given common-point reference	$(4, 0)$
Original polar rule	$r = 4$

Answer. $\theta = 0$ and $\theta = 2\pi$ both give $(4, 0)$.

Explanation and check.

The radius is 4 at both coterminal endpoint angles, so the two polar pairs locate the same point.

Worked example

Problem. A polar table contains $(\theta, r) = (\frac{\pi}{3}, 2)$ and $(4\frac{\pi}{3}, -2)$. Do the rows locate the same point? Give the coordinate.

Solve the card and move only to the card whose incoming header matches the entire requested response.

θ	Given r
$\frac{\pi}{3}$	2
$4\frac{\pi}{3}$	-2

Answer. Yes; both locate $(1, \sqrt{3})$.

Explanation and check.

The angles differ by π and the radii are opposites, so the polar pairs are equivalent. Converting the first gives $(2 \cos(\frac{\pi}{3}), 2 \sin(\frac{\pi}{3})) = (1, \sqrt{3})$.