Sets & Steps
Math Practice & Worked Solutions

AP Precalculus

Tangent Function Transformations

Tangent Function Transformations | APPC-U03-P15

96 problems · Four activity formats

Topic focus

Across 96 tasks this topic asks for compatible pattern or precise contradiction, invariants, center outputs, and orientation, period, zero family, and asymptote family, failed relation and corrected feature statement, invalid claim or first invalid step, corrected conclusion, brief mathematical reason, and the requested underlying result and included zeros and asymptote locations.

8 PDFs and a README; 151 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

Tangent Function Transformations

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.

List every zero and every vertical-asymptote location inside the specified window. Solve integer bounds for the two families separately and honor each open or closed display endpoint exactly.

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

Condition	Supplied value
Given vertical-asymptote family	$x = \frac{\pi}{2} + k(\frac{\pi}{2})$
Required window	$(-3\frac{\pi}{4}, 5\frac{\pi}{4}]$
Given zero family	$x = \frac{\pi}{4} + k(\frac{\pi}{2})$

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.

Compare the two supplied tangent models without solving a general tangent equation. State what happens to period, asymptotes, branch-center outputs, former zeros, and branch orientation after the vertical translation, with special attention to the required evidence focus. The supplied models are $f(x) = 3\tan(\frac{1}{2}(x))$ and $g(x) = 3\tan(\frac{1}{2}(x)) + 1$. The branch-center family is $x = 0 + k(2\pi)$. The required evidence focus is to state exactly which invariants come from the inner map.

Solve the problem and show enough exact work for the requested result.

Condition	Supplied value
Given branch-center input family	$x = 0 + k(2\pi)$
Required evidence focus	state exactly which invariants come from the inner map
Given output translation	1

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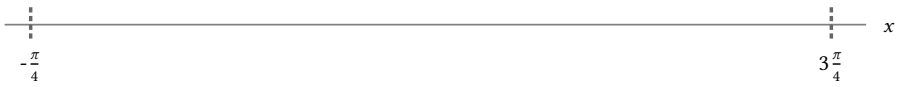
Begin at START. Answer the card, then find the matching final answer at the top of another card. Use the recording sheet for your reasoning. Visit each card once and continue to FINISH.

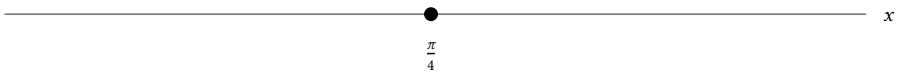
Incoming: zeros are $-15\frac{\pi}{4}, -7\frac{\pi}{4}, \frac{\pi}{4}, 9\frac{\pi}{4}, 17\frac{\pi}{4}$; asymptote locations are $-19\frac{\pi}{4}, -11\frac{\pi}{4}, -3\frac{\pi}{4}, 5\frac{\pi}{4}, 13\frac{\pi}{4}, 21\frac{\pi}{4}$.

Recover the horizontal period and a phase-anchor class from the graph evidence. Decide whether the asymptote spacing is one period or several, and state exactly what sign ambiguity remains; use orientation only when it is supplied.

Observed asymptote locations



Marked branch-center input



Feature	Exact x-location(s)
Observed asymptote locations	$-\frac{\pi}{4}, 3\frac{\pi}{4}$
Marked branch-center input	$\frac{\pi}{4}$

Condition	Supplied value
Given adjacency information	certified consecutive
Given branch direction	not supplied
Given outer coefficient	not orientation-resolving

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: “Omit $x = -7\frac{\pi}{3}$ and $x = 7\frac{\pi}{6}$ because boundary locations can never appear in requested zero or asymptote lists.” Diagnose the first invalid step or assumption, give the corrected conclusion, and justify the correction. Then complete or verify the underlying task: Use this route: audit both endpoint flags. Enumerate zeros from $x = -\frac{\pi}{3} + k(\pi)$ and poles from $x = \frac{\pi}{6} + k(\pi)$ inside $[-7\frac{\pi}{3}, 7\frac{\pi}{6}]$, honoring every endpoint.

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

Condition	Supplied value
Given vertical-asymptote family	$x = \frac{\pi}{6} + k(\pi)$
Required window	$[-7\frac{\pi}{3}, 7\frac{\pi}{6}]$
Given zero family	$x = -\frac{\pi}{3} + k(\pi)$

Tangent Function Transformations

Full Worked Solutions - excerpt

Worked example

Problem. Find the first invalid relation in the worked tangent-feature calculation, repair only that relation, and verify the correction with one representative zero, asymptote, or spacing check.

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

Condition	Supplied value
Step to examine	calls every branch center an x-intercept after adding $d = 4$

Answer. centers have output 4 and need not be x-intercepts.

Explanation and check.

Check the tangent-specific period π, the separate inner-angle conditions for zeros and poles, and the role of any vertical offset. Preserve steps that remain valid after the single correction. At an old center, the inner angle is 0 and $\tan(0) = 0$. After the stated translation by 4, the output there is 4, not 0. This direct substitution verifies that the old center is not an x-intercept.

Worked example

Problem. Find the first invalid relation in the worked tangent-feature calculation, repair only that relation, and verify the correction with one representative zero, asymptote, or spacing check.

Compare the stated objects or approaches and justify the conclusion with exact evidence.

Condition	Supplied value
Step to examine	reports $T = -\frac{\pi}{3}$ for $b = -3$

Answer. period is positive $\frac{\pi}{3}$.

Explanation and check.

Check the tangent-specific period π, the separate inner-angle conditions for zeros and poles, and the role of any vertical offset. Preserve steps that remain valid after the single correction. With $b = -3$ and $T = \frac{\pi}{3}$, the inner-angle change is $-3(\frac{\pi}{3}) = -\pi$. Tangent has the same value after that change, while T is positive. The claimed negative value is not a period length.