

AP Precalculus
Tangent Parent Function Graphs

Tangent Parent Function Graphs | APPC-U03-P14

96 problems · Four activity formats

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Topic focus

Across 96 tasks this topic asks for signed unbounded behavior without an assigned value, method/conclusion choice, justification, and endpoint-aware output interval, tangent entries and branch conclusion, one disconnected increasing branch, domain, range, and monotonicity and endpoint-aware output interval.

8 PDFs and a README; 140 buyer pages.

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.

Select the candidate that can represent $y = \tan(x)$. Defend the choice with structural evidence and explain why local steepness or a cropped rising segment, by itself, cannot settle the match.

The axes have exact radian labels: yes.

Compare these candidates: A = decreasing branches between the same cosine-zero gaps; B = a continuous bounded wave with range $[-1, 1]$; C = U -shaped reciprocal branches with no x -intercepts; D = an odd graph through $(0, 0)$ whose central component approaches $-\infty$ and $+\infty$ at its excluded ends.

Apply this decision constraint: Distinguish increasing tangent branches from decreasing cotangent branches.

Some candidate cards are cropped: no.

Work on the domain structural identification of the tangent parent.

Bank label: _____

Complete the tangent column using $\tan(x) = \frac{\sin(x)}{\cos(x)}$. Mark a row undefined rather than dividing by zero, then use the ordered rows to state one graph conclusion; do not connect points across an undefined input.

Required response

$\cos(x)$	$\sin(x)$	x
-1.000	0.025	$-\pi - 0.025$
-1.000	0.000	$-\pi$
-1.000	-0.025	$-\pi + 0.025$

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.

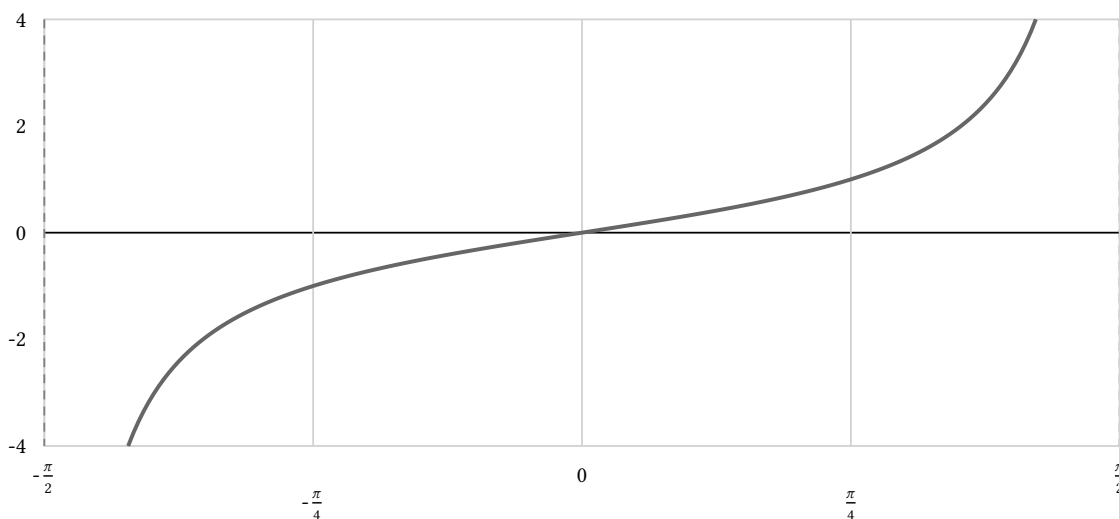
Reconstruct $y = \tan(x)$ on the displayed window using half-turn translations of the supplied central branch. List every visible zero and vertical asymptote, keep the branches disconnected, and state how many connected branch pieces meet the interior of the window.

The source branch is $-\frac{\pi}{2} < x < \frac{\pi}{2}$.

The target window is display endpoints included is yes; left is $-9\frac{\pi}{4}$; right is $3\frac{\pi}{4}$.

The translation rule is (x, y) maps to $(x + k\pi, y)$.

Work on the domain half-turn repetition of the tangent parent.



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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 claim is false on $[5\frac{\pi}{4}, 7\frac{\pi}{4})$. The component ranges are $[1, \infty)$ and $(-\infty, -1)$; tangent increases on each component, but the gap at $3\frac{\pi}{2}$ prevents a single increasing interval claim.

Complete the tangent column using $\tan(x) = \frac{\sin(x)}{\cos(x)}$. Mark a row undefined rather than dividing by zero, then use the ordered rows to state one graph conclusion; do not connect points across an undefined input.

Required response

$\cos(x)$	$\sin(x)$	x
0.999	-0.050	$-2\pi - 0.05$
1.000	0.000	-2π
0.999	0.050	$-2\pi + 0.05$

Your response: _____

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**Tangent Parent
Function Graphs****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.

Identify the defining contradiction in the student's tangent graph or statement. Give the smallest mathematical repair and support it with the quotient definition or branch structure; do not redraw unrelated valid features.

Evaluate claim 1.

Limit your correction to change only the contradicted feature.

Evaluate this student work: The graph labels $x = \frac{\pi}{2}$ as an x -intercept at $(\frac{\pi}{2}, 0)$.

Work on the domain diagnosis of a proposed tangent graph.

Identify the defining contradiction in the student's tangent graph or statement. Give the smallest mathematical repair and support it with the quotient definition or branch structure; do not redraw unrelated valid features.

Evaluate claim 2.

Limit your correction to change only the contradicted feature.

Evaluate this student work: The graph's y -axis states that the range of tangent is $[-1, 1]$.

Work on the domain diagnosis of a proposed tangent graph.

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Full Worked Solutions - excerpt

Worked example

Problem. Use the supplied sine and cosine sign evidence to determine the one-sided behavior of $\tan(x)$ at the excluded input. Justify each quotient sign and explicitly state that the function has no value at the boundary.

The excluded input is $-5\frac{\pi}{2}$.

The requested order is both sides.

The supplied sign information is cos from left is -; cos from right is +; sin near boundary is -.

Work on the domain one-sided quotient behavior.

Answer. as $x \rightarrow -5\frac{\pi}{2}^-$, $\tan(x) \rightarrow +\infty$; as $x \rightarrow -5\frac{\pi}{2}^+$, $\tan(x) \rightarrow -\infty$; $\tan(-5\frac{\pi}{2})$ is undefined.

Explanation and check.

On the left, numerator and small denominator have the same sign, so the quotient is large positive. On the right their signs differ, so it is large negative. A one-sided trend does not define a value where cosine equals zero.

Worked example

Problem. Use the supplied sine and cosine sign evidence to determine the one-sided behavior of $\tan(x)$ at the excluded input. Justify each quotient sign and explicitly state that the function has no value at the boundary.

The excluded input is $-15\frac{\pi}{2}$.

The requested order is left side then right side.

The supplied sign information is cos changes sign is + to -; sin at boundary is +1.

Work on the domain one-sided quotient behavior.

Answer. as $x \rightarrow -15\frac{\pi}{2}^-$, $\tan(x) \rightarrow +\infty$; as $x \rightarrow -15\frac{\pi}{2}^+$, $\tan(x) \rightarrow -\infty$; $\tan(-15\frac{\pi}{2})$ is undefined.

Explanation and check.

On the left, numerator and small denominator have the same sign, so the quotient is large positive. On the right their signs differ, so it is large negative. A one-sided trend does not define a value where cosine equals zero.