LESSON MAKER PRO

Tangent Tracks

Find the repeat and the breaks in a tangent graph.

HIGH SCHOOL · MT.PLUS.ALG.TRIG.3.b

MT.PLUS.ALG.TRIG.3.b "Graph trigonometric functions with and without the use of technology by: Graphing tangent functions, identifying period and asymptotes."

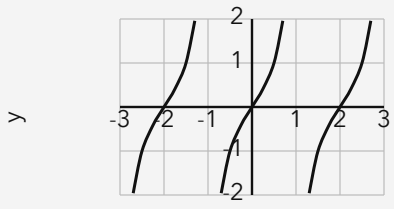
NAME _____ DATE _____

PERIOD AND ASYMPTOTES

For y = a tan(bx + c) + d, the period is pi/|b|. Vertical asymptotes occur where bx + c = pi/2 + k*pi for any integer k. On a graph, look for the gaps between branches.

WORKED EXAMPLE

Each horizontal unit on the graph represents pi/7. Find the period and the two vertical asymptotes nearest x = 0.



1. Matching branches cross the x-axis 2 horizontal units apart.
2. Period = 2(pi/7) = 2pi/7.
3. The nearest gaps are 1 unit left and right of 0, at x = -pi/7 and x = pi/7.

Answer: Period: 2pi/7. Nearest asymptotes: x = -pi/7 and x = pi/7.

PRACTICE 4 problems

1 For y = tan(3x), find the period and the asymptotes on either side of x = 0.

ANSWER _____

2 For y = tan(x/4), find the period and the asymptotes on either side of x = 0.

ANSWER _____

3 For y = tan(2(x - pi/4)), find the period and the asymptotes on either side of x = pi/4.

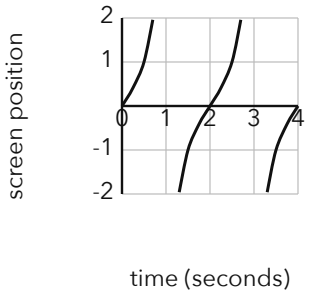
ANSWER _____

4 For y = tan(6x) + 1, find the period and the asymptotes on either side of x = 0.

ANSWER _____

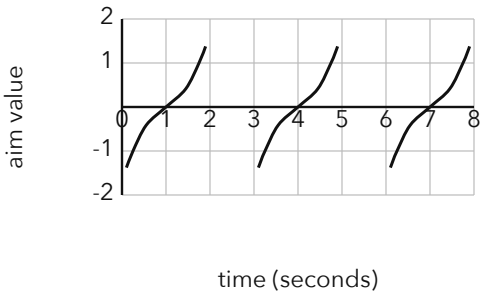
APPLY IT Show your work

1 A phone camera pans past a wall. Its horizontal screen position is graphed against time in seconds. Find the period and the first time after t = 0 when the model is undefined.



ANSWER _____

2 A video game graphs a rotating pointer's horizontal aim value against time. Find the period and the first two positive times when the value is undefined.



ANSWER _____

CHALLENGE One step up

A tangent graph has consecutive asymptotes at x = -pi/8 and x = 3pi/8. Its branch crosses the x-axis halfway between them. Find its period and an equation in the form y = tan(b(x - h)), with b > 0. Explain your choices.

WORK SPACE AND ANSWER

ANSWER KEY

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	For y = tan(3x), find the period and the asymptotes on either side of x = 0.	**Period: pi/3. Asymptotes: x = -pi/6 and x = pi/6.**
2	For y = tan(x/4), find the period and the asymptotes on either side of x = 0.	**Period: 4pi. Asymptotes: x = -2pi and x = 2pi.**
3	For y = tan(2(x - pi/4)), find the period and the asymptotes on either side of x = pi/4.	**Period: pi/2. Asymptotes: x = 0 and x = pi/2.**
4	For y = tan(6x) + 1, find the period and the asymptotes on either side of x = 0.	**Period: pi/6. Asymptotes: x = -pi/12 and x = pi/12.**

PART 2 · APPLY IT

1. **Period: 2 seconds. First undefined time after t = 0: t = 1 second.** The graph repeats at its crossings at 0 and 2 seconds. The first gap between branches is centered at 1 second.
2. **Period: 3 seconds. First two positive undefined times: t = 5/2 seconds and t = 11/2 seconds.** Matching crossings at 1, 4, and 7 seconds show a period of 3 seconds. The gaps between these branches are centered at 5/2 and 11/2 seconds.

CHALLENGE

The period is 3pi/8 - (-pi/8) = pi/2, so b = pi/(pi/2) = 2. The midpoint is h = pi/8. One equation is y = tan(2(x - pi/8)).

Accept equivalent forms of the equation in the challenge. Graphs show rounded sample points; use the repeating branches to identify exact periods and asymptotes.