6.4 Graphing Trig Functions

MATH LAB

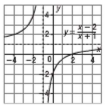
6.4 Graphing Trigonometric Functions

FOCUS Sketch the graphs of $y = \sin x$, $y = \cos x$, and $y = \tan x$ and determine their characteristics.

Get Started

For the function $y = \frac{x-2}{x+1}$, identify:

the equations of the asymptotes;
the domain; the range; and the intercepts

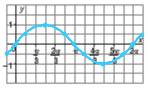


Construct Understanding

A. Complete the tables below, then sketch a graph of $y = \sin x$ for $0 \le x \le 2\pi$.
Identify: the domain; the range; and the intercepts of the graph.

x	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{3\pi}{4}$	$\frac{5\pi}{6}$	π
$\sin x$	0	$\frac{1}{2}$			1			$\frac{1}{2}$	0

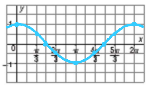
x	$\frac{7\pi}{6}$	$\frac{5\pi}{4}$	$\frac{4\pi}{3}$	$\frac{3\pi}{2}$	$\frac{5\pi}{3}$	$\frac{7\pi}{4}$	$\frac{11\pi}{6}$	2π
$\sin x$	$-\frac{1}{2}$			-1			$-\frac{1}{2}$	0



B. Repeat Part A for $y = \cos x$.

x	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{3\pi}{4}$	$\frac{5\pi}{6}$	π
$\cos x$	1			$\frac{1}{2}$	0	$-\frac{1}{2}$			-1

x	$\frac{7\pi}{6}$	$\frac{5\pi}{4}$	$\frac{4\pi}{3}$	$\frac{3\pi}{2}$	$\frac{5\pi}{3}$	$\frac{7\pi}{4}$	$\frac{11\pi}{6}$	2π
$\cos x$			$-\frac{1}{2}$	0	$\frac{1}{2}$			1



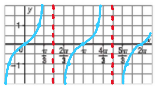
THINK FURTHER

Suppose you were to graph the reciprocal trigonometric ratios $y = \csc\theta$, $y = \sec\theta$, $y = \cot\theta$. Would the graphs have vertical asymptotes? If so, where?

C. Repeat Part A for $y = \tan x$.
Identify the equations of the asymptotes.

x	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{3\pi}{4}$	$\frac{5\pi}{6}$	π
$\tan x$	0		1		DNE		-1		0

x	$\frac{7\pi}{6}$	$\frac{5\pi}{4}$	$\frac{4\pi}{3}$	$\frac{3\pi}{2}$	$\frac{5\pi}{3}$	$\frac{7\pi}{4}$	$\frac{11\pi}{6}$	2π
$\tan x$		1		DNE		-1		0



D. Explain how to extend each graph for $x > 2\pi$ and for $x < 0$.

Assess Your Understanding

Use graphing technology.

1. Explain why each of $y = \sin x$, $y = \cos x$, and $y = \tan x$ is a function.

All pass the vertical line test.

2. Graph $y = \sin x$ [redacted]
Identify the domain, range, and zeros of the graph.
Write a general expression that represents the zeros.

D: $x \in \mathbb{R}$
R: $\{-1 \le y \le 1\}$
zeros: $x = n\pi$, $n \in \mathbb{Z}$

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3. Repeat question 2 for $y = \cos x$ [redacted]

D: $x \in \mathbb{R}$
R: $\{-1 \leq y \leq 1\}$
zeros: $\frac{(2n+1)\pi}{2}$, $n \in \mathbb{Z}$

* coefficient is an odd integer

4. Repeat question 2 for $y = \tan x$ [redacted]
Identify the equations of the asymptotes and write a general expression that represents them.

D: $\{x \in \mathbb{R} \mid x \neq \frac{(2n+1)\pi}{2}, n \in \mathbb{Z}\}$
R: $y \in \mathbb{R}$
zeros: $x = n\pi$, $n \in \mathbb{Z}$
asymptotes: $x = \frac{(2n+1)\pi}{2}$, $n \in \mathbb{Z}$

ANSWERS

2. $-4\pi \leq x \leq 4\pi; -1 \leq y \leq 1; \pm 4\pi, \pm 3\pi, \pm 2\pi, \pm\pi, 0; k\pi, k \in \mathbb{Z}$

3. $-4\pi \leq x \leq 4\pi; -1 \leq y \leq 1; \pm\frac{2\pi}{2}, \pm\frac{5\pi}{2}, \pm\frac{3\pi}{2}, \pm\frac{\pi}{2}; (2k+1)\frac{\pi}{2}, k \in \mathbb{Z}$

4. $x \neq \pm\frac{\pi}{2}, x \neq \pm\frac{3\pi}{2}, x \neq \pm\frac{5\pi}{2}, x \neq \pm\frac{2\pi}{2}, y \in \mathbb{R}; \pm 4\pi, \pm 3\pi, \pm 2\pi, \pm\pi, 0; k\pi,$
$k \in \mathbb{Z}; x = \pm\frac{\pi}{2}, x = \pm\frac{3\pi}{2}, x = \pm\frac{5\pi}{2}, x = \pm\frac{2\pi}{2}, x = (2k+1)\frac{\pi}{2}, k \in \mathbb{Z}$