Trigonometric Functions

6.9 Graphs of Other Trigonometric Functions

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The tangent function is a quotient that relies on sine and cosine. We analyze some properties of tangent by examining sine and cosine functions.

$\mathbf{x}$	$\sin \mathbf{x}$	$\cos \mathbf{x}$	$\tan \mathbf{x} = \dfrac{\sin \mathbf{x}}{\cos \mathbf{x}}$	$(\mathbf{x}, \mathbf{y})$ **or ASYMPTOTE**
0	0	1	0	(0, 0)
$\frac{\pi}{2}$	1	0	undefined	vertical asymptote: $x = \frac{\pi}{2}$
π	0	-1	0	$(\pi, 0)$
$\frac{3\pi}{2}$	-1	0	undefined	vertical asymptote: $x = \frac{3\pi}{2}$
2π	0	1	0	$(2\pi, 0)$

Graph of $y = \tan x$

1. The x-intercepts occur at multiples of π. $x = n\pi$
2. Vertical asymptotes occur at odd integer multiples of $\frac{\pi}{2}$.

$$x = \frac{(2n+1)\pi}{2}$$

3. The domain is the set of all real numbers except odd integer multiples of $\frac{\pi}{2}$. $x \neq \frac{(2n+1)\pi}{2}$
4. The range is the set of all real numbers. $(-\infty, \infty)$
5. $y = \tan x$ has period π. *[*$\tan(-x) = -\tan x$ *(odd)]*
6. $y = \tan x$ *is an odd function (symmetric about the origin).*
7. The graph has no defined amplitude, since the function is unbounded.

Plot of $y = \tan x$