4.6 Graphing the Other Trigonometric Functions

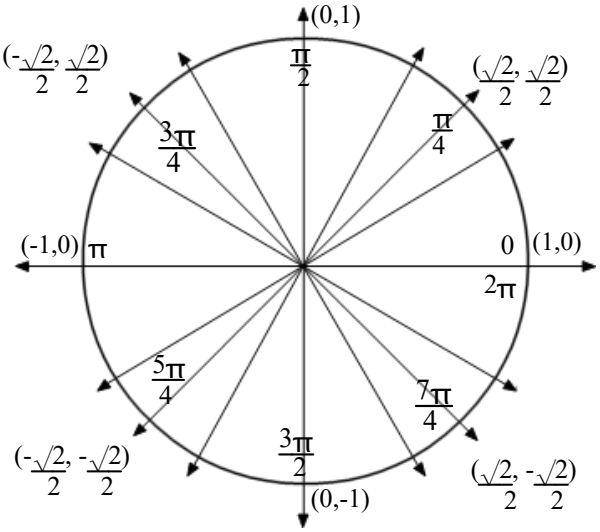
The Graph of:

$y = \tan x$

as it relates to the Unit Circle

x	$y = \tan x$
0	0
π/4	1
π/2	undefined
3π/4	−1
π	0
5π/4	1
3π/2	undef
7π/4	−1
2π	0

(1,0)
0/1
(0,1)
1/0



Where are the asymptotes?

x	$-\frac{\pi}{2}$	-1.57	-1.5	$-\frac{\pi}{4}$	0	$\frac{\pi}{4}$	1.5	1.57	$\frac{\pi}{2}$
$\tan x$	Undef.	-1255.8	-14.1	-1	0	1	14.1	1255.8	Undef.

$\tan x$ approaches $-\infty$ as x approaches $-\pi/2$ from the right.

$\tan x$ approaches ∞ as x approaches $\pi/2$ from the left.

Library of Parent Functions: Tangent Function

The basic characteristics of the parent tangent function are summarized below and on the inside cover of this text.

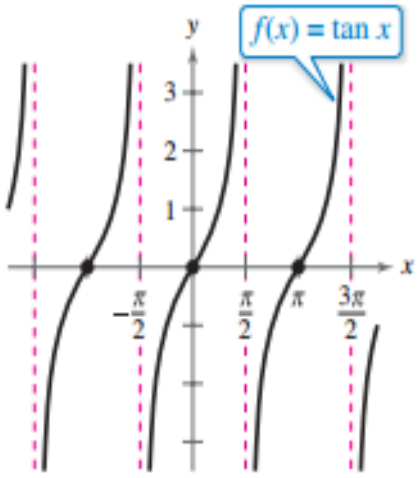


Figure 4.55

Domain: all real numbers x,
$$x \neq \frac{\pi}{2} + n\pi$$
Range: $(-\infty, \infty)$
Period: π
x-intercepts: $(n\pi, 0)$
y-intercept: $(0, 0)$
Vertical asymptotes: $x = \frac{\pi}{2} + n\pi$
Odd function
Origin symmetry

Graphing the Tangent and Cotangent Functions in the Calculator

Mode
Window
Graph

$y = a \tan(bx)$
$y = a \cot(bx)$

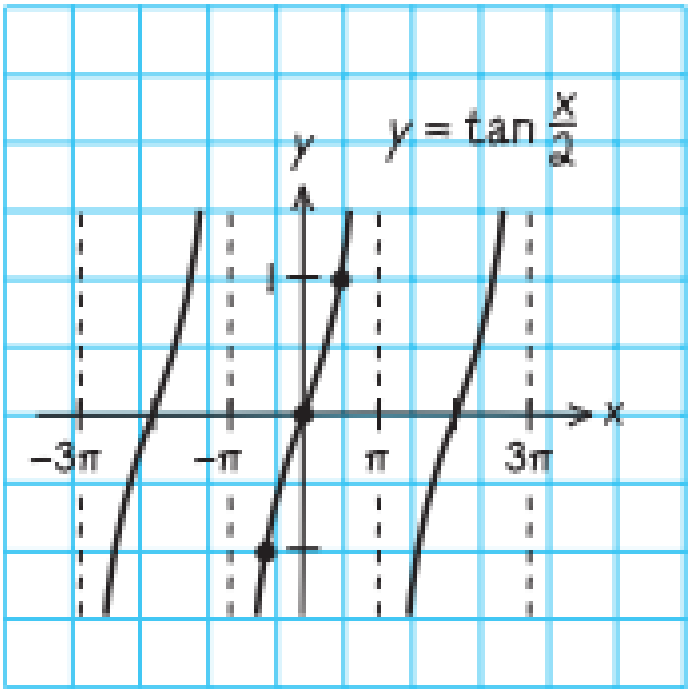
How does the a value change the graph?
Change window to -4π , 4π and -5, 5, and experiment with a values

y=2tan(2x)

How do you graph the cot?

How does the b value change the graph?
Change the a value back to 1, and experiment with b values

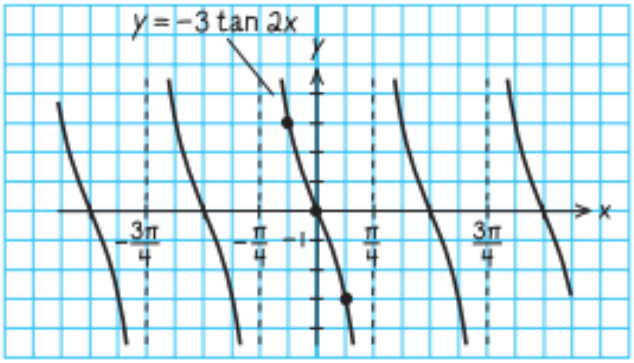
Sketch the graph of $y = \tan\frac{x}{2}$ by hand.



x	$-\pi$	$-\frac{\pi}{2}$	0	$\frac{\pi}{2}$	π
$\tan\frac{x}{2}$	Undef.	-1	0	1	Undef.

Sketch the graph of $y = -3 \tan 2x$ by hand.

x	$-\frac{\pi}{4}$	$-\frac{\pi}{8}$	0	$\frac{\pi}{8}$	$\frac{\pi}{4}$
$-3 \tan 2x$	Undef.	3	0	-3	Undef.



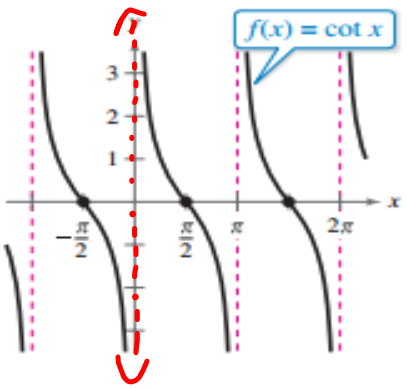
Graph of the Cotangent Function

Library of Parent Functions: Cotangent Function

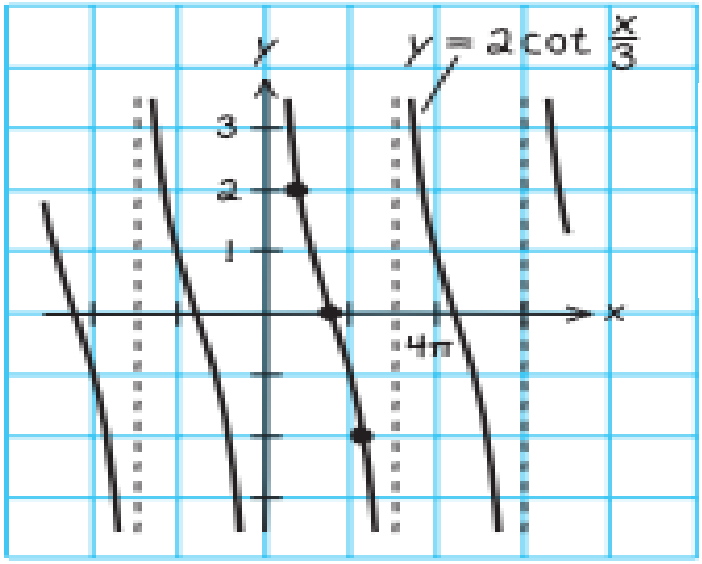
The graph of the parent cotangent function is similar to the graph of the parent tangent function. It also has a period of π. However, from the identity

$$f(x) = \cot x = \frac{\cos x}{\sin x}$$

you can see that the cotangent function has vertical asymptotes when $\sin x$ is zero, which occurs at $x = n\pi$, where n is an integer. The basic characteristics of the parent cotangent function are summarized below and on the inside cover of this text.

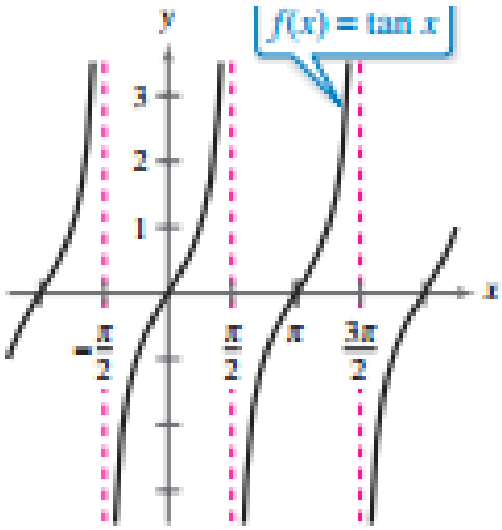


Domain: all real numbers x, $x \neq n\pi$
Range: $(-\infty, \infty)$
Period: π
x-intercepts: $\left(\frac{\pi}{2} + n\pi, 0\right)$
Vertical asymptotes: $x = n\pi$
Odd function
Origin symmetry



x	0	$\frac{3\pi}{4}$	$\frac{3\pi}{2}$	$\frac{9\pi}{4}$	3π
$2\cot\frac{x}{3}$	Undef.	2	0	-2	Undef.

Find the period!

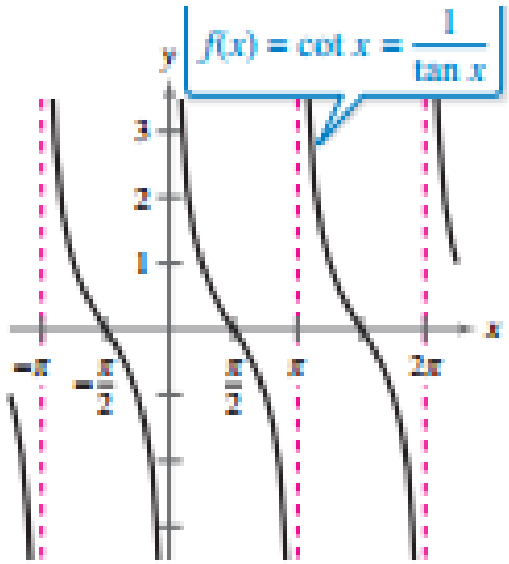


Domain: all real numbers x,

$$x \neq \frac{\pi}{2} + n\pi$$

Range: $(-\infty, \infty)$

Period: π



Domain: all real numbers x,

$$x \neq n\pi$$

Range: $(-\infty, \infty)$

Period: π