Chapter 4 Part 2 Summary Sheet

General equation of sine and cosine: $y = a\sin(bx - c) + d$ $\qquad$ $y = a\cos(bx - c) + d$

Amplitude – the distance from the position of equilibrium
Period – the length of one complete cycle of the graph
Phase Shift – a horizontal shift of the starting point
Vertical Translation – a vertical shift of all point of the graph

Amplitude: $|a|$ **Period:** $\dfrac{2\pi}{b}$ **Phase Shift:** $bx - c = 0$ **Vertical Translation:** d

General equation of cosecant and secant: $y = a\csc(bx - c) + d$ $\qquad$ $y = a\sec(bx - c) + d$

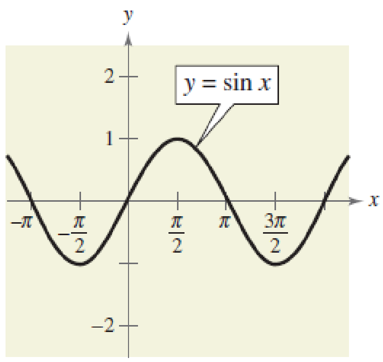
To graph csc x, draw a dotted graph of the reciprocal of csc x, sin x, with one additional step.
To graph sec x, draw a dotted graph of the reciprocal of sec x, cos x, with one additional step.

General equation of tangent and cotangent: $y = a\tan(bx - c) + d$ $\qquad$ $y = a\cot(bx - c) + d$

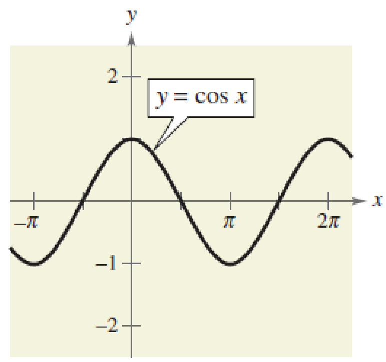
Amplitude: Not defined **Period:** $\dfrac{\pi}{b}$ **Phase Shift :** $bx - c = 0$ **Vertical Translation:** d

Tangent has a starting point. Cotangent has a starting asymptote.

Note: If a is negative, then graph is reflected x-axis initially.



DOMAIN: ALL REALS
RANGE: $[-1, 1]$
PERIOD: 2π



DOMAIN: ALL REALS
RANGE: $[-1, 1]$
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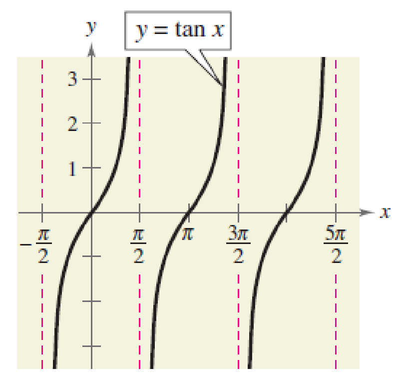
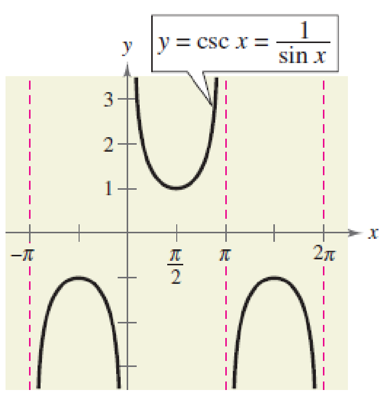
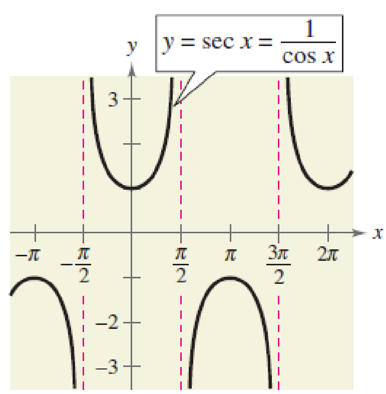


DOMAIN: ALL $x \neq \frac{\pi}{2} + n\pi$
RANGE: $(-\infty, \infty)$
PERIOD: π



DOMAIN: ALL $x \neq n\pi$
RANGE: $(-\infty, -1] \cup [1, \infty)$
PERIOD: 2π



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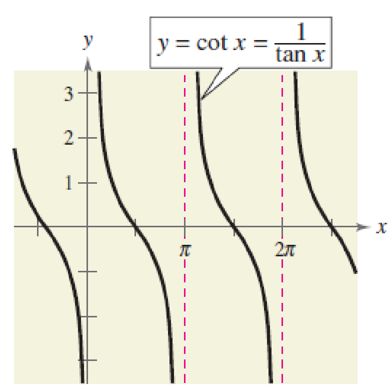

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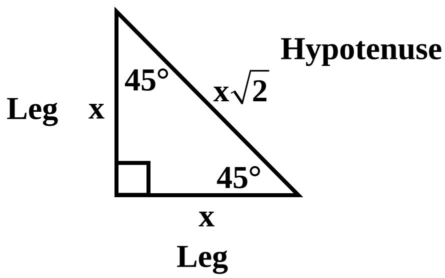
PERIOD: π

Inverse Trig Function	Angle Limits	Quadrants
$y = \arcsin x$ OR $y = \sin^{-1} x$	$-90° \le \theta \le 90°$ OR $-\frac{\pi}{2} \le \theta \le \frac{\pi}{2}$	I & IV
$y = \arccos x$ OR $y = \cos^{-1} x$	$0 \le \theta \le 180°$ OR $0 \le \theta \le \pi$	I & II
$y = \arctan x$ OR $y = \tan^{-1} x$	$-90° < \theta < 90°$ OR $-\frac{\pi}{2} < \theta < \frac{\pi}{2}$	I & IV

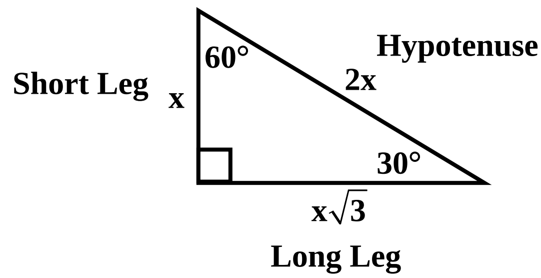
Important: The -1 in $\sin^{-1} x$ is NOT a power. It represent inverse notation, just as $f^{-1}(x)$ represent the inverse of f(x). $\sin^{-1} x \neq \frac{1}{\sin x}$

45°- 45°- 90°
Triangle Properties



Leg $\cdot \sqrt{2}$ **= Hypotenuse**

30°- 60°- 90°
Triangle Properties



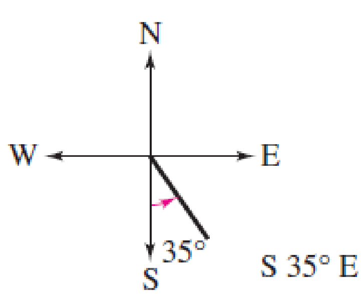
Short Leg $\cdot \sqrt{3}$ **= Long leg**
Short Leg $\cdot$ **2 = Hypotenuse**

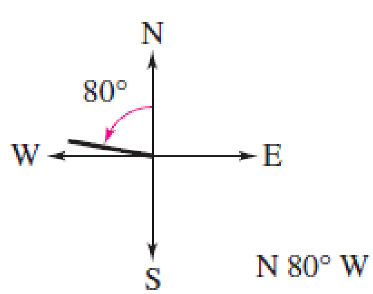
To isolate x in $\sin x = \frac{1}{2}$, you take the inverse sine of both sides of the equation.

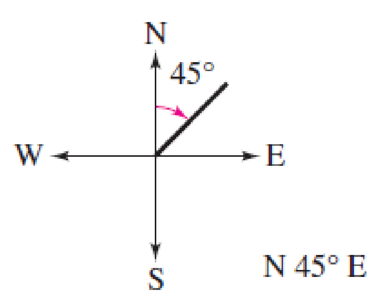
$$\sin x = \frac{1}{2} \quad \rightarrow \quad \sin^{-1}(\sin x) = \sin^{-1}\left(\frac{1}{2}\right) \quad \rightarrow \quad x = \sin^{-1}\left(\frac{1}{2}\right)$$

Bearings
In surveying and navigation, directions are generally given in terms of bearings. A bearing measures the acute angle that a path or line of sight makes with a fixed north-south line.
Examples:

35 degrees east of south **80 degrees west of north** **45 degrees east of north**







Definition of Simple Harmonic Motion $d = a \sin \omega t$ or $d = a \cos \omega t$

Distance from origin: d **Period:** $\frac{2\pi}{\omega}$ **Frequency (cycles per second):** $\frac{\omega}{2\pi}$