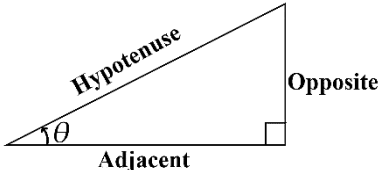
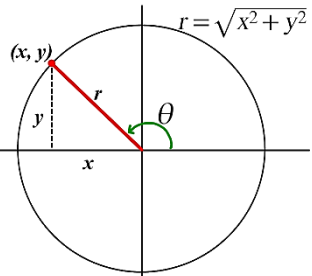
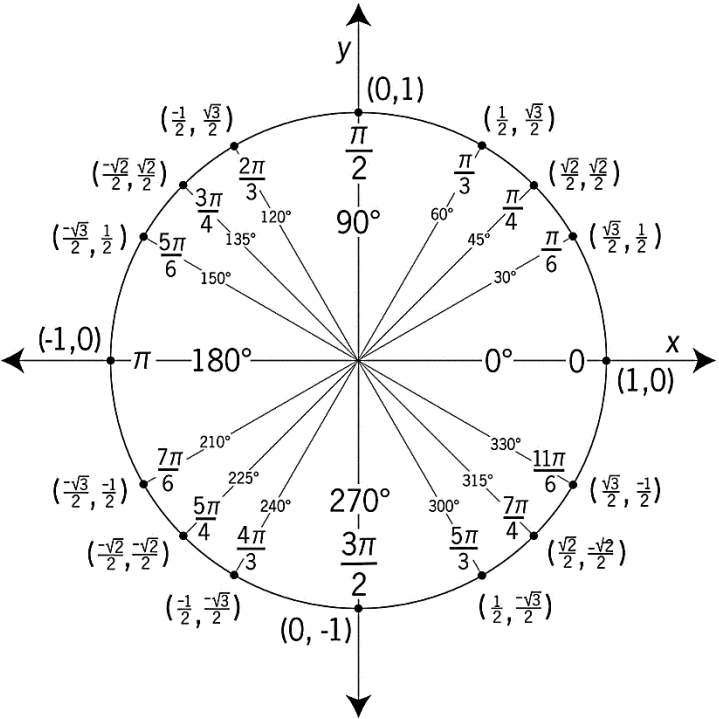
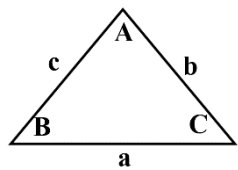
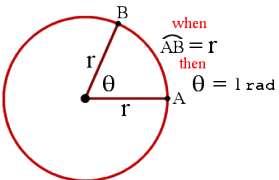
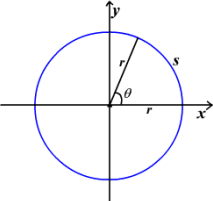
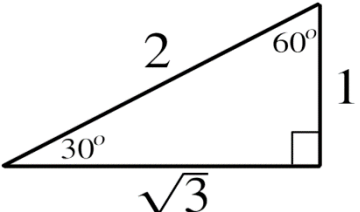
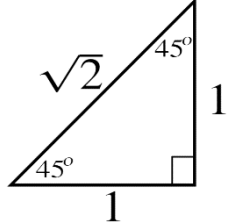


Precalculus Summary Sheet

<p>Definition of Six Trig Functions <i>Right triangle definitions where $0 < \theta < \pi/2$</i></p>  <p style="text-align: center;"> $\sin \theta = \frac{opp}{hyp}$ $\cos \theta = \frac{adj}{hyp}$ $\tan \theta = \frac{opp}{adj}$ $\csc \theta = \frac{hyp}{opp}$ $\sec \theta = \frac{hyp}{adj}$ $\cot \theta = \frac{adj}{opp}$ </p> <p>Circular function definitions where θ is any angle</p>  <p style="text-align: center;"> $r = \sqrt{x^2 + y^2}$ $\sin \theta = \frac{y}{r}$ $\csc \theta = \frac{r}{y}$ $\cos \theta = \frac{x}{r}$ $\sec \theta = \frac{r}{x}$ $\tan \theta = \frac{y}{x}$ $\cot \theta = \frac{x}{y}$ </p>	<p>Unit Circle Values</p> 
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<p>Law of Sines: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$</p>	<p>Law of Cosines Corollary: $\cos A = \frac{b^2 + c^2 - a^2}{2bc}$</p>	
<p>Law of Cosines: $a^2 = b^2 + c^2 - 2bc \cdot \cos A$, $b^2 = a^2 + c^2 - 2ac \cdot \cos B$, $c^2 = a^2 + b^2 - 2ab \cdot \cos C$</p>		
<p>Area of a triangle: $\frac{1}{2}ac \cdot \sin B$, $\frac{1}{2}bc \cdot \sin A$, $\frac{1}{2}ab \cdot \sin C$, or $\sqrt{s(s-a)(s-b)(s-c)}$ where $s = \frac{a+b+c}{2}$</p>		
<p>Radian Measure</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>when $\widehat{AB} = r$ then $\theta = 1 \text{ rad}$</p> </div> <div style="text-align: center;">  </div> </div> <p style="text-align: center;"><i>theta in radians</i></p> <p style="text-align: center;">Arc length $(s) = \theta \cdot r$</p> <p style="text-align: center;">Area of a circular sector = $\frac{1}{2}r^2\theta$</p> <p style="text-align: center;">$\pi = 180^\circ$</p>		

<p>Polar to Rectangular $x = r \cos \theta$, $y = r \sin \theta$</p> <p>Rectangular to Polar $r = \sqrt{x^2 + y^2}$ $\theta = \tan^{-1}(y/x)$ when $x > 0$ $\theta = \tan^{-1}(y/x) + \pi$ when $x < 0$</p>	<p>Special Right Triangles</p> <div style="display: flex; justify-content: space-around; align-items: center;">   </div>
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Reciprocal Identities

$$\sin x = \frac{1}{\csc x} \quad \cos x = \frac{1}{\sec x} \quad \tan x = \frac{1}{\cot x}$$

$$\csc x = \frac{1}{\sin x} \quad \sec x = \frac{1}{\cos x} \quad \cot x = \frac{1}{\tan x}$$

Tangent and Cotangent Identities

$$\tan x = \frac{\sin x}{\cos x} \quad \cot x = \frac{\cos x}{\sin x}$$

Pythagorean Identities

$$\sin^2 x + \cos^2 x = 1$$

$$1 + \tan^2 x = \sec^2 x \quad 1 + \cot^2 x = \csc^2 x$$

Cofunction Identities

$$\sin\left(\frac{\pi}{2} - x\right) = \cos x \quad \cos\left(\frac{\pi}{2} - x\right) = \sin x$$

$$\tan\left(\frac{\pi}{2} - x\right) = \cot x \quad \cot\left(\frac{\pi}{2} - x\right) = \tan x$$

$$\csc\left(\frac{\pi}{2} - x\right) = \sec x \quad \sec\left(\frac{\pi}{2} - x\right) = \csc x$$

Even-Odd Identities

$$\sin(-x) = -\sin x, \cos(-x) = \cos x, \tan(-x) = -\tan x$$

Double-Angle Formulas

$$\sin 2u = 2\sin u \cos u$$

$$\cos 2u = \cos^2 u - \sin^2 u$$

$$= \cos^2 u - 1$$

$$= 1 - 2\sin^2 u$$

$$\tan 2u = \frac{2\tan u}{1 - \tan^2 u}$$

Power-Reducing/Half-Angle Formulas

$$\sin^2 u = \frac{1 - \cos 2u}{2} \quad \sin \frac{u}{2} = \pm \sqrt{\frac{1 - \cos u}{2}}$$

$$\cos^2 u = \frac{1 + \cos 2u}{2} \quad \cos \frac{u}{2} = \pm \sqrt{\frac{1 + \cos u}{2}}$$

$$\tan^2 u = \frac{1 - \cos 2u}{1 + \cos 2u} \quad \tan \frac{u}{2} = \pm \sqrt{\frac{1 - \cos u}{1 + \cos u}}$$

Sum and Difference Formulas

$$\sin(u \pm v) = \sin u \cos v \pm \cos u \sin v$$

$$\cos(u \pm v) = \cos u \cos v \mp \sin u \sin v$$

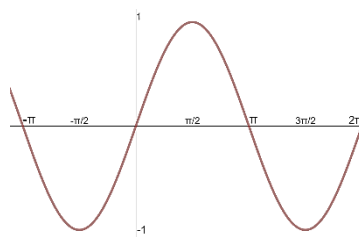
$$\tan(u \pm v) = \frac{\tan u \pm \tan v}{1 \mp \tan u \tan v}$$

Graphs of Trig Functions

$$f(x) = \sin x$$

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

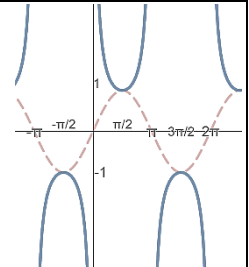
Range: $[-1, 1]$



$$f(x) = \csc x$$

Domain: $\{x | x \neq n\pi\}$ where n is an integer

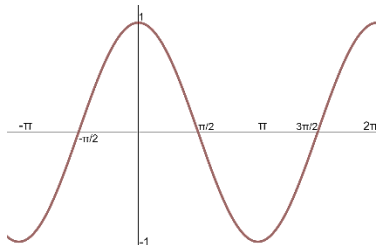
Range: $(-\infty, -1] \cup [1, \infty)$



$$f(x) = \cos x$$

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

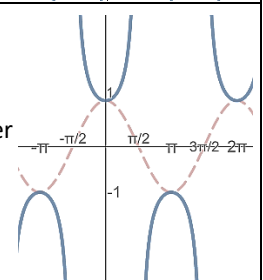
Range: $[-1, 1]$



$$f(x) = \sec x$$

Domain: $\{x | x \neq \frac{\pi}{2} + n\pi\}$ where n is an integer

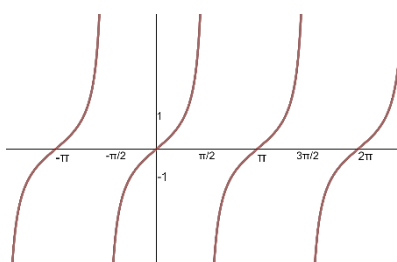
Range: $(-\infty, -1] \cup [1, \infty)$



$$f(x) = \tan x$$

Domain: $\{x | x \neq \frac{\pi}{2} + n\pi\}$ where n is an integer

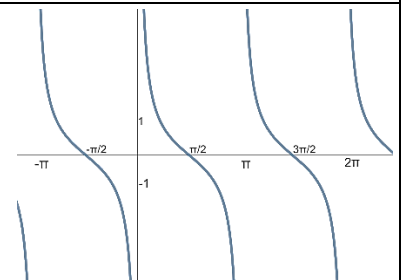
Range: all reals



$$f(x) = \cot x$$

Domain: $\{x | x \neq n\pi\}$ where n is an integer

Range: all reals



$$\text{Quadratic Formula: } x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\text{for } ax^2 + bx + c = 0$$

Compounding Interest

$$\text{Periodic: } A = P \left(1 + \frac{r}{n}\right)^{nt}$$

$$\text{Continuous: } A = Pe^{rt}$$