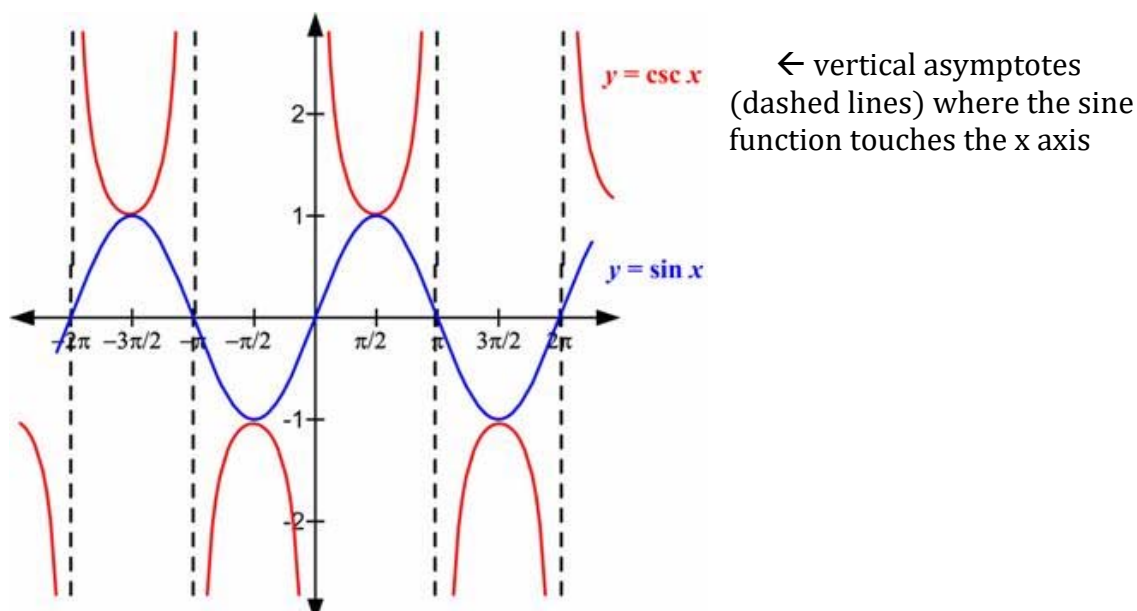


Graphs of Secant, Cosecant, Tangent, and Cotangent

Graphs of Secant and Cosecant

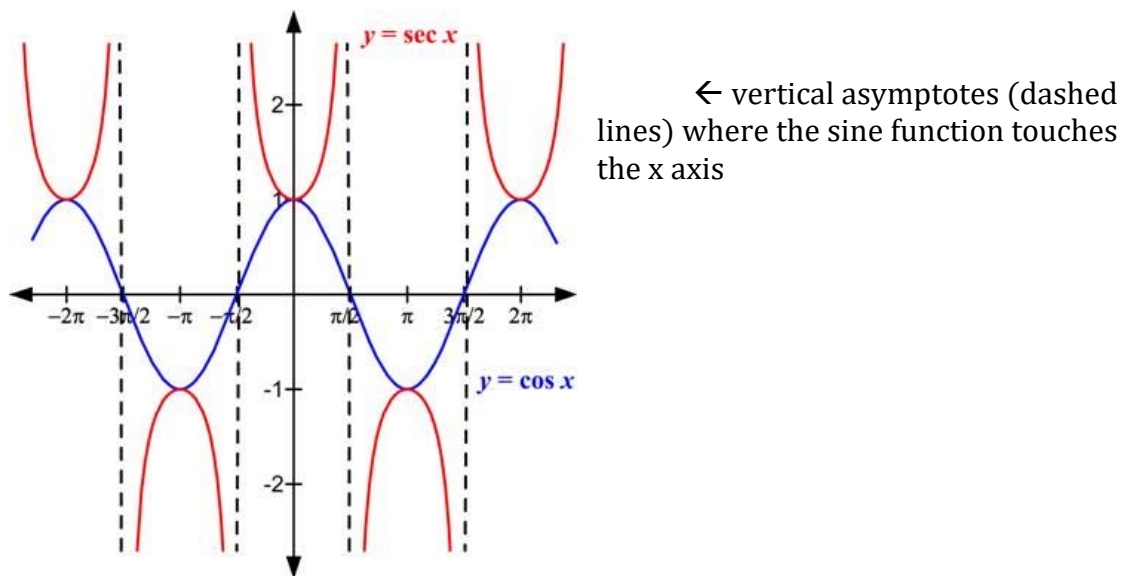
Cosecant:

Cosecant is the reciprocal of sine $\rightarrow$ if sine has a max value of 1, cosecant will have a min value at 1; if sine has a min value of -1, cosecant will have a max value at -1, etc



Secant:

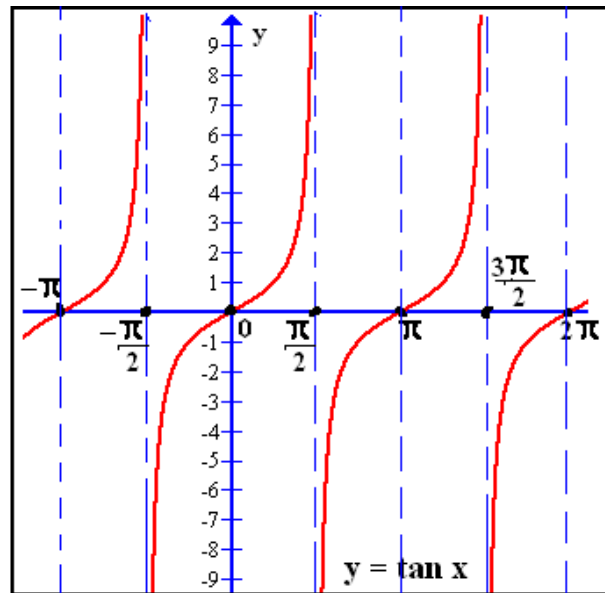
Secant is the reciprocal of cosine $\rightarrow$ if cosine has a max value of 1, secant will have a min value at 1; if cosine has a min value of -1, secant will have a max value at -1, etc



Tangent:

Characteristics of the graph of $y=\tan(x)$:

- There are *vertical asymptotes* wherever tangent is undefined [wherever $\cos(x) = 0$ since $\tan(x) = \sin(x)/\cos(x)$] $\leftarrow$ graph will never touch/cross these asymptotes
- The *period* is π (this is because if you look at the unit circle, the values of tangent repeat themselves every half revolution, or π revolutions)
- *Domain*: all real numbers except where the asymptotes occur
- *Range*: all real numbers
- *No amplitude*

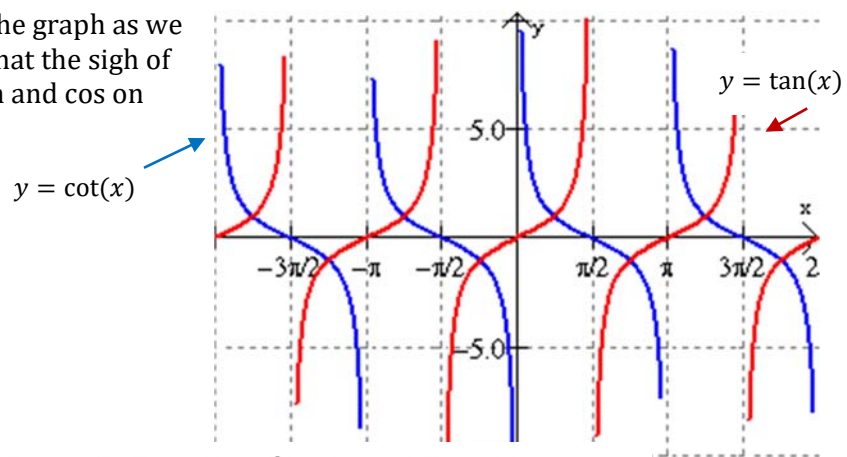


- Between 0 and $\frac{\pi}{2}$ sine and cosine are both positive $\rightarrow$ tangent is positive
- Between $\frac{\pi}{2}$ and π sine is positive but cosine is negative $\rightarrow$ tangent is negative
- Between π and $\frac{3\pi}{2}$ sine is negative and cosine is negative $\rightarrow$ tangent is positive
- Between $\frac{3\pi}{2}$ and 2π sine is negative and cosine is positive $\rightarrow$ tangent is negative

Cotangent:

Cotangent is the reciprocal of tangent $\rightarrow$ While the graph of $y=\tan(x)$ has vertical asymptotes where $\cos(x)=0$, $y=\cot(x)$ has vertical asymptotes where $\sin(x)=0$ [since $\cot(x) = \cos(x)/\sin(x)$]

Same rules apply to construct the graph as we did $y=\tan(x)$ $\rightarrow$ check to see what the sign of cot is based upon the sign of sin and cos on that interval (quadrant)



- Between 0 and $\frac{\pi}{2}$ sine and cosine are both positive $\rightarrow$ cotangent is positive
- Between $\frac{\pi}{2}$ and π sine is positive but cosine is negative $\rightarrow$ cotangent is negative
- Between π and $\frac{3\pi}{2}$ sine is negative and cosine is negative $\rightarrow$ cotangent is positive
- Between $\frac{3\pi}{2}$ and 2π sine is negative and cosine is positive $\rightarrow$ cotangent is negative