

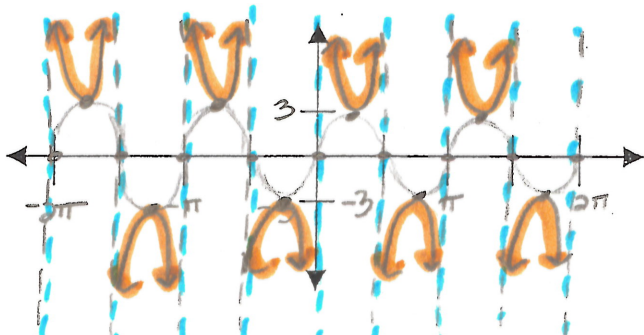
Section 3.6 - Tangent, Cotangent, Secant and Cosecant

\*Graphing  $y = A \csc(Bx + C)$

Recall :  $y = \csc x = 1/\sin x \rightarrow$  Graph the corresponding sine wave, then csc from there ; x-intercepts of sin become asymptotes of csc.

Ex. 1: Graph  $y = 3 \csc(2x)$  ,  $-2\pi \leq x \leq 2\pi$ .

Amp: 3       $P = \frac{2\pi}{2} = \pi$



Ex. 2: Graph  $y = -2 \csc(2\pi x + \pi/2)$  ,  $-2 \leq x \leq 2$ .

Amp: 2       $\Delta$  FLIP  $\times$

$P = \frac{2\pi}{2\pi} = 1$

$2\pi x + \frac{\pi}{2} = 0$

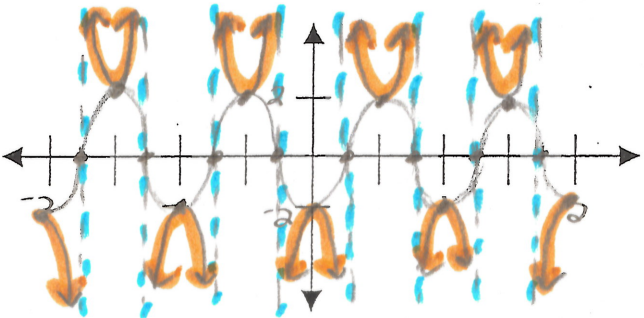
$\frac{2\pi x}{2\pi} = \left(\frac{-\pi/2}{2\pi}\right) \frac{1}{2\pi}$

$x = -\frac{1}{4}$   
Start

$2\pi x + \frac{\pi}{2} = 2\pi$   
 $-\frac{\pi}{2} \quad -\frac{\pi}{2}$

$\frac{2\pi x}{2\pi} = \left(\frac{3\pi/2}{2\pi}\right) \frac{1}{2\pi}$

$x = \frac{3}{4}$  End

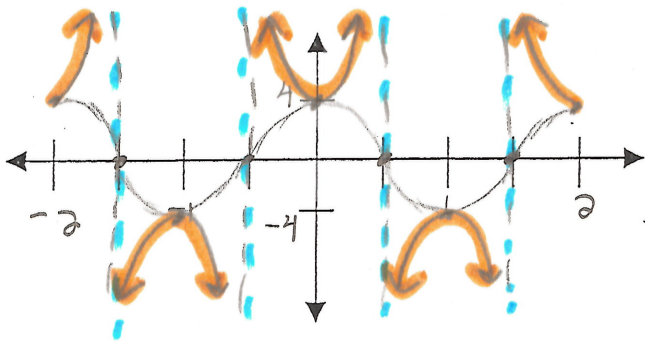


\*Graphing  $y = A \sec(Bx + C)$

Recall :  $y = \sec x = 1/\cos x \rightarrow$  Graph the corresponding cosine wave, then sec from there; x-intercepts of cos become asymptotes of sec.

Ex. 3: Graph  $y = 4 \sec(\pi x)$  ,  $-2 \leq x \leq 2$ .

Amp: 4       $P = \frac{2\pi}{\pi} = 2$



Ex. 4: Graph  $y = \frac{1}{2} \sec(4x - \pi)$  ,  $0 \leq x \leq \pi$ .

Amp:  $\frac{1}{2}$

$P = \frac{2\pi}{4} = \frac{\pi}{2}$

$4x - \pi = 0$

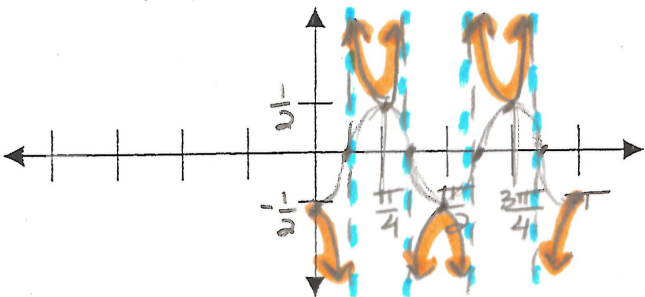
$\frac{4x}{4} = \frac{\pi}{4}$

$x = \frac{\pi}{4}$   
Start

$4x - \pi = 2\pi$   
 $x + \pi$

$\frac{4x}{4} = \frac{3\pi}{4}$

$x = \frac{3\pi}{4}$   
End



\*Graphing  $y = A \tan(Bx + C)$  and  $y = A \cot(Bx + C)$

$|A|$ : distance from horizontal axis at  $\frac{1}{4}$  period and  $\frac{3}{4}$  period

$-A$ : reflect graph across horizontal axis

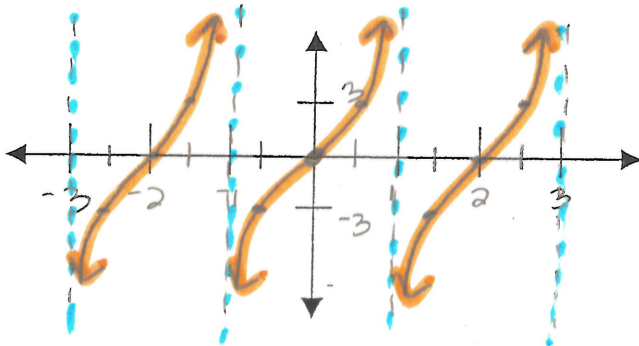
Period =  $\pi/B$

Phase Shift =  $-C/B$  (Solve  $Bx + C = 0$  to see where 1<sup>st</sup> cycle starts)

Graph 3 Critical Points

- 1) Horizontal Intercept (at mid-period)
- 2)  $\frac{1}{4}$  period amp.
- 3)  $\frac{3}{4}$  period amp.

Ex. 5: Graph  $y = 3 \tan(\pi x/2)$ ,  $-3 < x < 3$ .

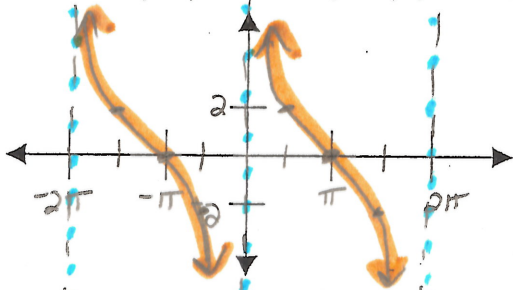


$$\text{Amp} = 3$$

$$P = \frac{\pi}{\frac{\pi}{2}} \cdot \frac{2}{\pi} = 2$$

$$P.S. = \frac{-C}{B} = \frac{-0}{\frac{\pi}{2}} = 0 \rightarrow \text{Still start } x\text{-int at } 0$$

Ex. 6: Graph  $y = 2 \cot(x/2)$ ,  $-2\pi \leq x \leq 2\pi$ .

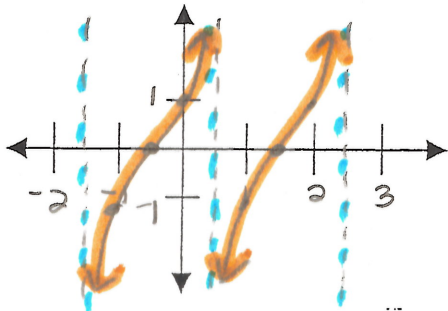


$$\text{Amp} = 2$$

$$P = \frac{\pi}{\frac{1}{2}} = 2\pi$$

$$P.S. = \frac{-C}{B} = \frac{-0}{\frac{1}{2}} = 0 \rightarrow \text{Still start } \text{asymp. at } 0$$

Ex. 7: Graph  $y = \tan(\pi x/2 + \pi/4)$ ,  $-1.5 < x < 2.5$ .



$$\text{Amp} = 1$$

$$P = \frac{\pi}{\frac{\pi}{2}} \cdot \frac{2}{\pi} = 2$$

$$\frac{\pi x}{2} + \frac{\pi}{4} = 0$$

$$\frac{\pi}{2}x = -\frac{\pi}{4} \cdot \frac{2}{\pi}$$

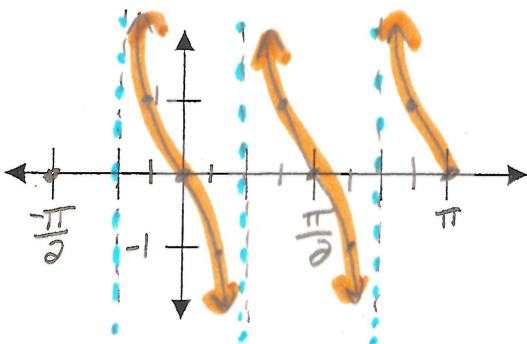
$$x = -\frac{1}{2} \text{ Start}$$

$$\frac{\pi x}{2} + \frac{\pi}{4} = \pi$$

$$\frac{\pi}{2}x = \frac{3\pi}{4} \cdot \frac{2}{\pi}$$

$$x = \frac{3}{2} \text{ End}$$

Ex. 8: Graph  $y = \cot(2x + \pi/2)$ ,  $-\pi/2 \leq x \leq \pi$ .



$$\text{Amp} = 1$$

$$P = \frac{\pi}{2}$$

$$2x + \frac{\pi}{2} = 0$$

$$\frac{2x}{2} = \frac{-\pi/2}{2} \cdot \frac{1}{2}$$

$$x = -\frac{\pi}{4} \text{ Start}$$

$$2x + \frac{\pi}{2} = \pi$$

$$\frac{2x}{2} = \frac{\pi/2}{2} \cdot \frac{1}{2}$$

$$x = \frac{\pi}{4} \text{ End}$$