

EXAMPLE 1:

Sketch the graph and locate the vertical asymptotes of $y = \csc \frac{1}{2}x + 1$.

Original	a / b shift	h / k shift
$(0, 0)$	$(0, 0)$	$(0, 1)$
$(\frac{\pi}{2}, 1)$	$(\pi, 1)$	$(\pi, 2)$
$(\pi, 0)$	$(2\pi, 0)$	$(2\pi, 1)$
$(\frac{3\pi}{2}, -1)$	$(3\pi, -1)$	$(3\pi, 0)$
$(2\pi, 0)$	$(4\pi, 0)$	$(4\pi, 1)$

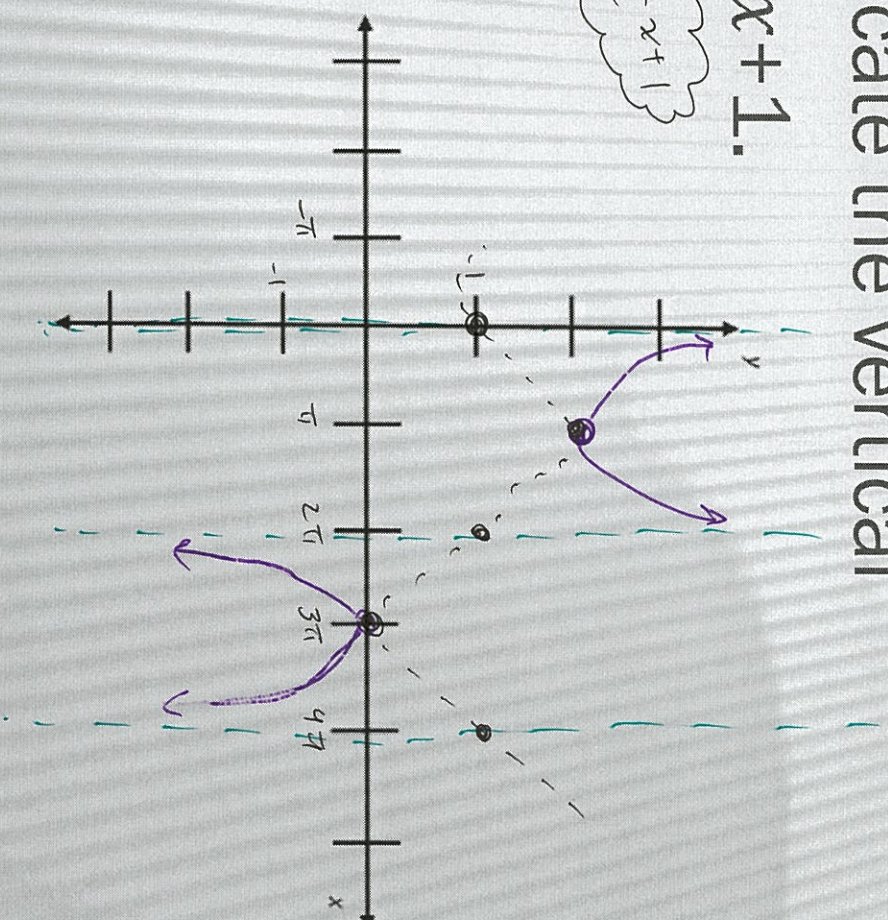
$0.2(x\text{-values})$ $y+1$

$y = \sin \frac{1}{2}x + 1$

$P = 4\pi$

$S_L = \pi$

$U_P = 1$



$\frac{1}{2}x$

$\frac{1}{2}x = 0$

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

$x = 0$

$x = 2\pi$

asymptotes!

EXAMPLE 2:

Locate the vertical asymptotes of the graph of

$$y = 3\csc 2(x + \pi).$$

Original	a/b shift	h/k shift
$(0, 0)$	$(0, 0)$	$(-\pi, 0)$
$(\frac{\pi}{2}, 1)$	$(\frac{\pi}{4}, 3)$	$(-\frac{3\pi}{4}, 3)$
$(\pi, 0)$	$(\frac{\pi}{2}, 0)$	$(-\frac{\pi}{2}, 0)$
$(\frac{3\pi}{2}, -1)$	$(\frac{3\pi}{4}, -3)$	$(-\frac{\pi}{4}, -3)$
$(2\pi, 0)$	$(\pi, 0)$	$(0, 0)$

$3-y$ $\frac{1}{2}x$

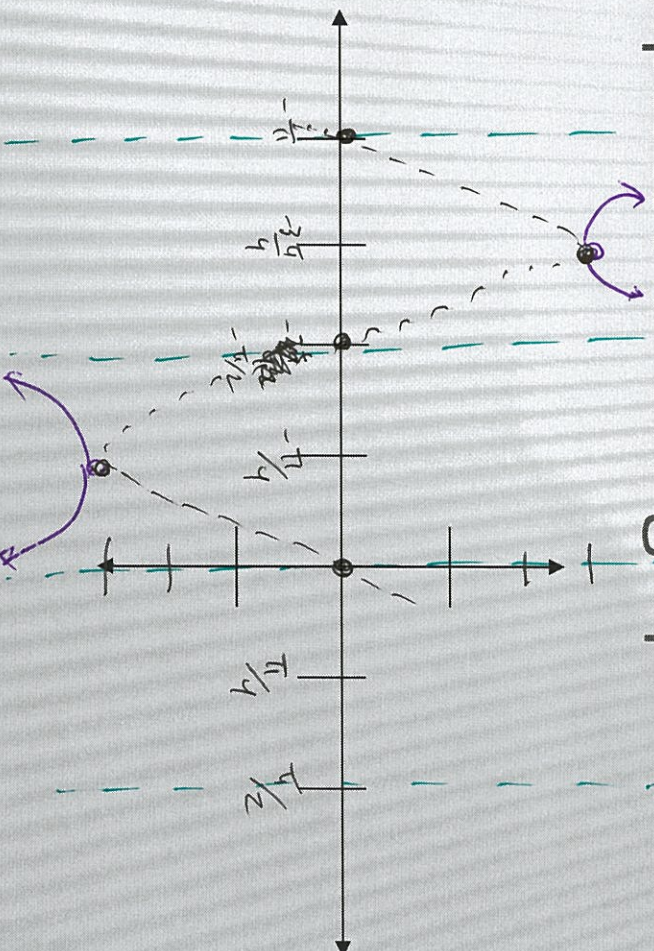
$-\pi$ (x -values)

L π

$$P = \pi$$

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

Original	a/b shift	h/k shift
$(0, 0)$	$(0, 0)$	$(-\pi, 0)$
$(\frac{\pi}{2}, 1)$	$(\frac{\pi}{4}, 3)$	$(-\frac{3\pi}{4}, 3)$
$(\pi, 0)$	$(\frac{\pi}{2}, 0)$	$(-\frac{\pi}{2}, 0)$
$(\frac{3\pi}{2}, -1)$	$(\frac{3\pi}{4}, -3)$	$(-\frac{\pi}{4}, -3)$
$(2\pi, 0)$	$(\pi, 0)$	$(0, 0)$



to v

$$2(x + \pi) = 0 \quad 2(x + \pi) = \pi$$

$$x = -\pi$$

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

asymptotes!

EXAMPLE 3:

Locate the vertical asymptotes and sketch the graph of $y = -\sec 2x$.

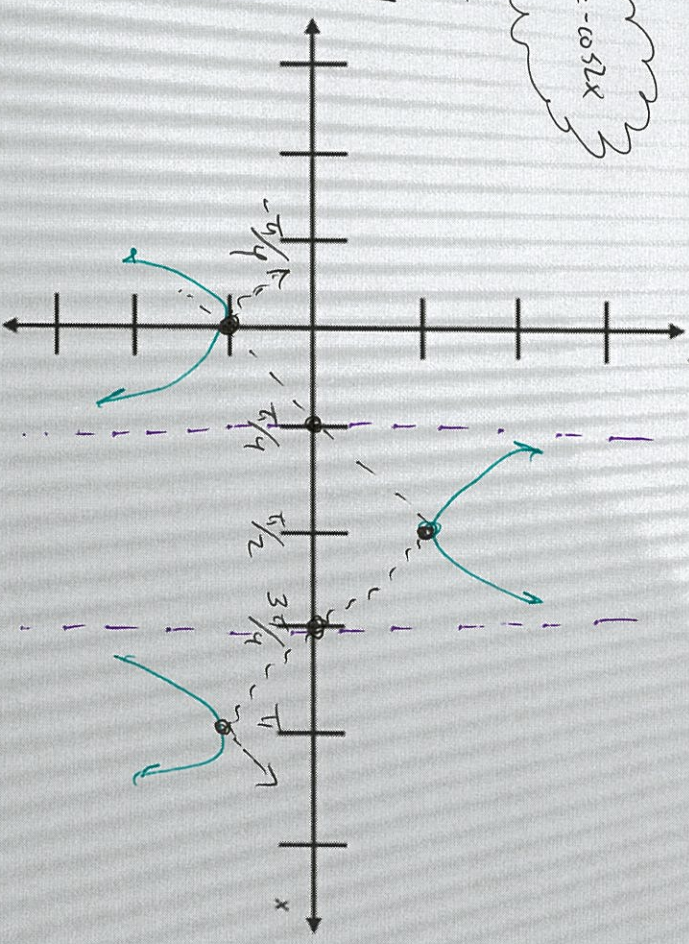
Original	a/b shift	h/k shift
$(0, 1)$	$(0, -1)$	
$(\frac{\pi}{2}, 0)$	$(\frac{\pi}{4}, 0)$	
$(\pi, -1)$	$(\frac{\pi}{2}, -1)$	
$(\frac{3\pi}{2}, 0)$	$(\frac{3\pi}{4}, 0)$	
$(2\pi, 1)$	$(\pi, 1)$	

$$y(-1) \cdot x(\frac{1}{2})$$

$$y = -\cos 2x$$

$$P = \pi$$

$$S_c = \pi/4$$



to ✓

$$x = \frac{\pi}{2} \cdot \frac{1}{2} \quad x = \frac{3\pi}{2} \cdot \frac{1}{2}$$

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

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

Asymp to $\pm \pi$!

EXAMPLE 4:

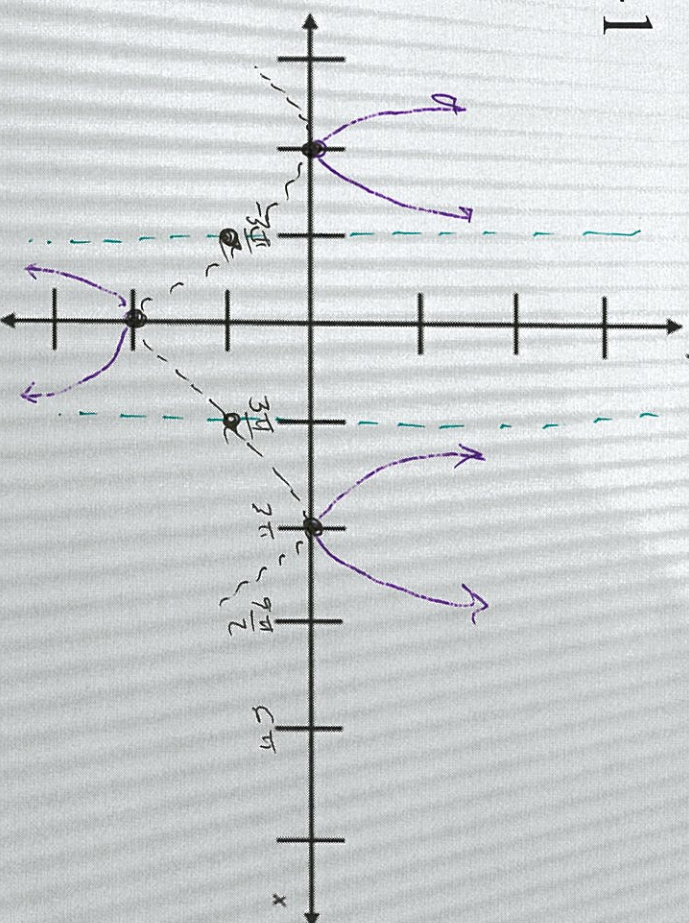
$$y = \cos^{-1}\left(\frac{x+3\pi}{3}\right) - 1$$

$$P = 6\pi \quad L = 3\pi$$

$$S_c = 3\frac{\pi}{2} \quad D = 1$$

Locate the vertical asymptotes and sketch the graph of $y = \sec\left(\frac{x}{3} + \pi\right) - 1$

Original	a / b shift	h / k shift
$(0, 1)$	$(0, 1)$	$(-3\pi, 0)$
$(\frac{\pi}{2}, 0)$	$(\frac{3\pi}{2}, 0)$	$(-\frac{3\pi}{2}, -1)$
$(\pi, -1)$	$(3\pi, -1)$	$(0, -2)$
$(\frac{3\pi}{2}, 0)$	$(\frac{9\pi}{2}, 0)$	$(\frac{3\pi}{2}, -1)$
$(2\pi, 1)$	$(6\pi, 1)$	$(3\pi, 0)$



To V

$$\frac{x}{3} + \pi = \frac{\pi}{2}$$

$$\frac{x}{3} = -\frac{\pi}{2}$$

$$x = -\frac{3\pi}{2}$$

$$\frac{x}{3} + \pi = \frac{3\pi}{2}$$

$$\frac{x}{3} = -\frac{\pi}{2}$$

$$x = -\frac{3\pi}{2}$$

Asym!

EXAMPLE 5:

Sketch the graph and locate the vertical asymptotes of $y = 3\tan(2x - \pi) + 1$.

Asymptotes!

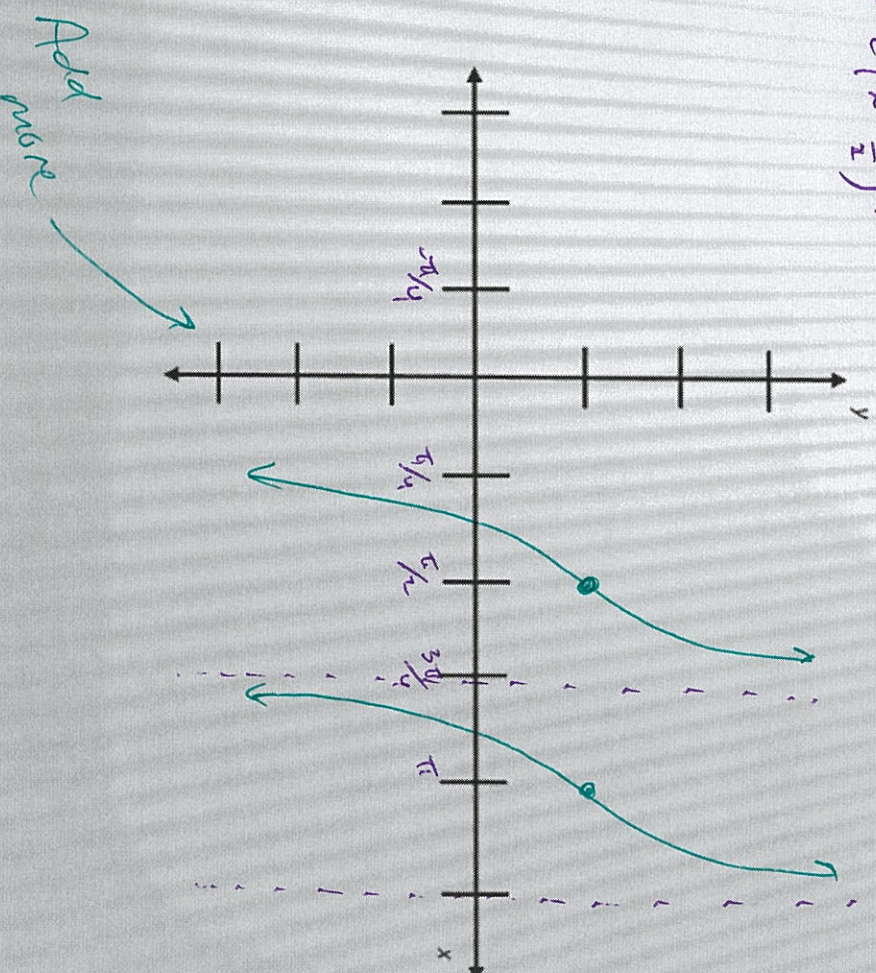
$$3 \tan 2 \left(x - \frac{\pi}{2} \right) + 1$$

$$P = -\pi \quad S_c = \frac{\pi}{4}$$

$$\begin{array}{l} 2x - \pi = \frac{\pi}{2} \\ +\pi \quad +\pi \end{array} \quad \left| \quad \begin{array}{l} 2x - \pi = \frac{3\pi}{2} \\ +\pi \quad +\pi \end{array} \right.$$

$$2x = \frac{3\pi}{2} \quad \left(\frac{5\pi}{2} \right)$$

$$x = \frac{3\pi}{4} \quad x = \frac{5\pi}{4}$$



EXAMPLE 6:

Sketch the graph and locate the vertical

asymptotes of $y = \cot 4 \left(x - \frac{\pi}{8} \right)$

Asymptotes:

$$4 \left(x - \frac{\pi}{8} \right) = 0$$

$$x - \frac{\pi}{8} = 0$$

$$x = \frac{\pi}{8}$$

$$4 \left(x - \frac{\pi}{8} \right) = \pi$$

$$x - \frac{\pi}{8} = \frac{\pi}{4}$$

$$x = \frac{3\pi}{8}$$

