

1.  $y = \tan \frac{1}{3}x - 1$   $A^+$

Period:  $\pi \cdot 3 = 3\pi$

Vertical Shift:  $-1$

Phase Shift:  $0$

Asymptotes:  $x = \frac{3}{2}\pi + 3n\pi$

Domain:  $\mathbb{R}$  except  $x \neq \frac{3}{2}\pi + 3n\pi$  Range:  $\mathbb{R}$



2.  $y = -2\cot(x - \frac{\pi}{2})$   $A^\ominus$

Period:  $\pi$

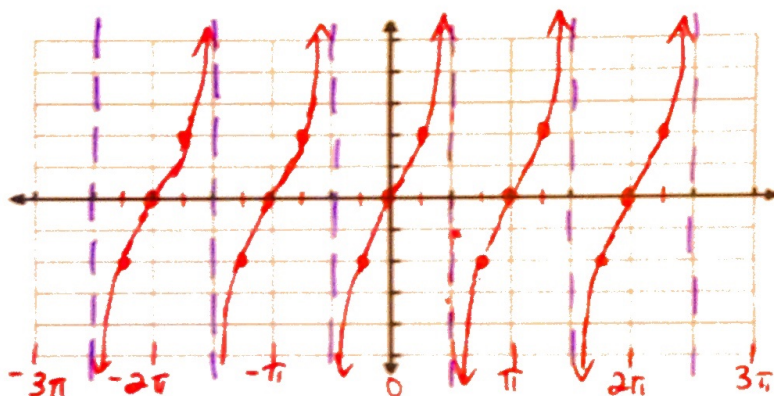
Vertical Shift:  $0$

Phase Shift:  $\frac{\pi}{2}$

Asymptotes:  $x = \frac{\pi}{2} + n\pi$

Domain:  $\mathbb{R}$  except  $x \neq \frac{\pi}{2} + n\pi$  Range:  $\mathbb{R}$

$A^\ominus$   
 v. stretch by 2



3.  $y = \cot(2x) + 3$   $A^\ominus$

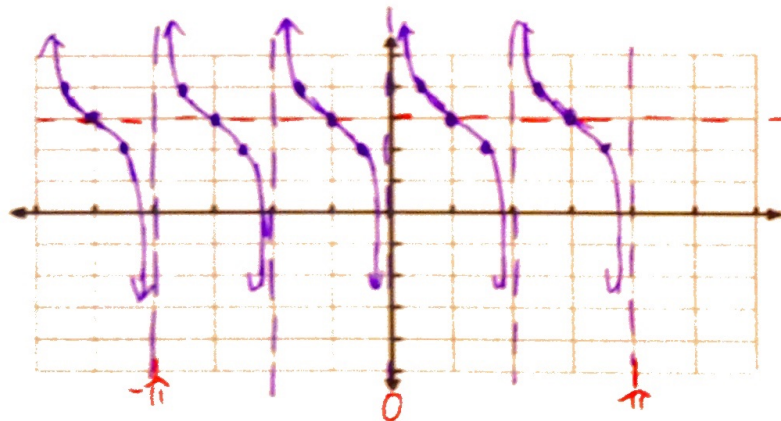
Period:  $\frac{\pi}{2}$

Vertical Shift:  $+3$

Phase Shift:  $0$

Asymptotes:  $x = n\frac{\pi}{2}$

Domain:  $\mathbb{R}$  except  $x \neq n\frac{\pi}{2}$  Range:  $\mathbb{R}$



4.  $y = -\tan(\frac{1}{2}x + \frac{\pi}{2})$

$y = -\tan \frac{1}{2}(x + \pi)$

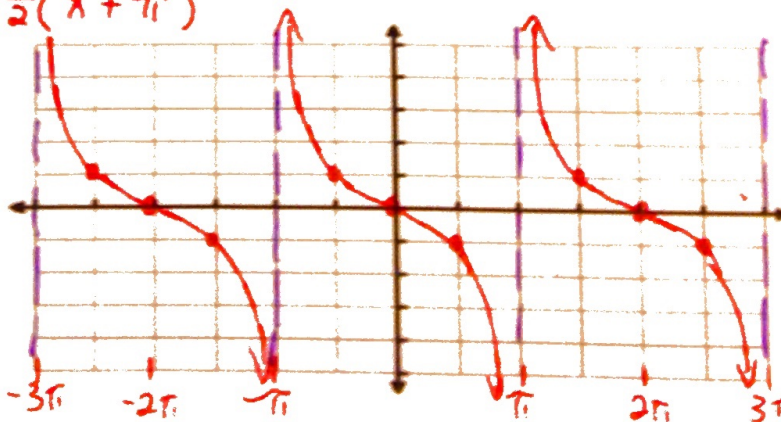
Period:  $\pi \cdot 2 = 2\pi$   $A^\ominus$

Vertical Shift:  $0$

Phase Shift:  $-\pi$

Asymptotes:  $x = \pi + 2n\pi$

Domain:  $\mathbb{R}$  except  $x \neq \pi + 2n\pi$  Range:  $\mathbb{R}$



5.  $y = 3\tan(\pi x)$

Period:  $\frac{\pi}{\pi} = 1$

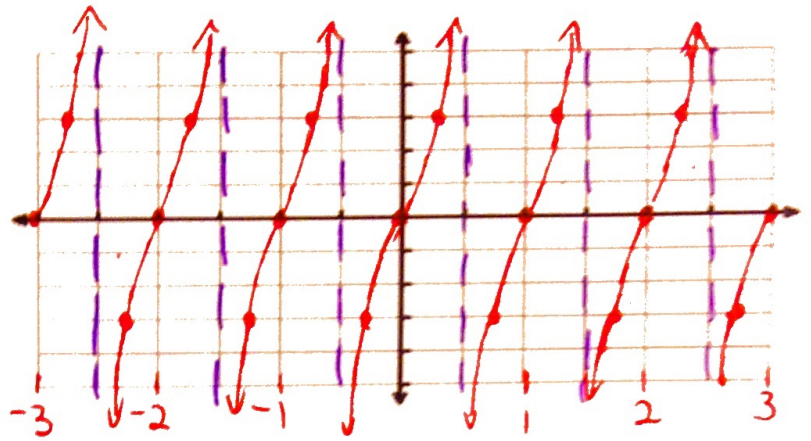
Vertical Shift: 0  
Phase Shift: 0

Asymptotes:  $x = \frac{1}{2} + n$

Domain:  $\mathbb{R}$   
except  $x \neq \frac{1}{2} + n$

Range:  $\mathbb{R}$

$A \oplus$   
V. stretch  
by 3



6.  $y = -\csc\left(\frac{\pi}{2}x + \pi\right)$

Graph  $y = -\sin\frac{\pi}{2}(x+2)$  as reference

Period:  $2\pi \cdot \frac{2}{\pi} = 4$

Vertical Shift: 0  
Phase Shift: -2

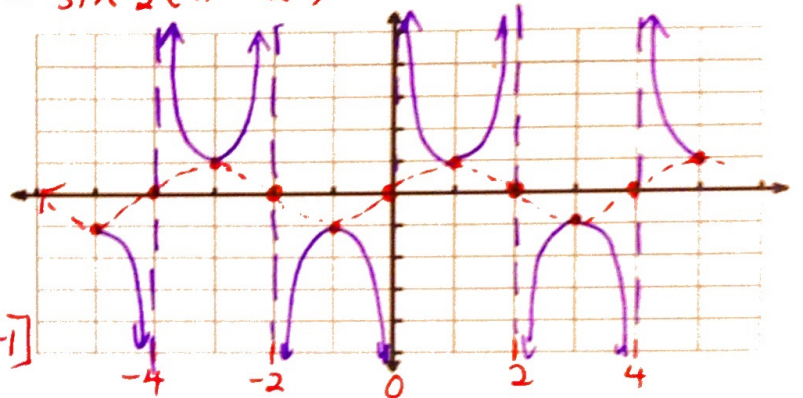
Asymptotes:

$x = 2n$

Domain:

$\mathbb{R}$   
except  $x \neq 2n$

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



7.  $y = \frac{3}{2}\sec\frac{x}{4} - 2$

Graph  $y = \frac{3}{2}\cos\frac{x}{4} - 2$  as reference

Period:  $2\pi \cdot 4 = 8\pi$

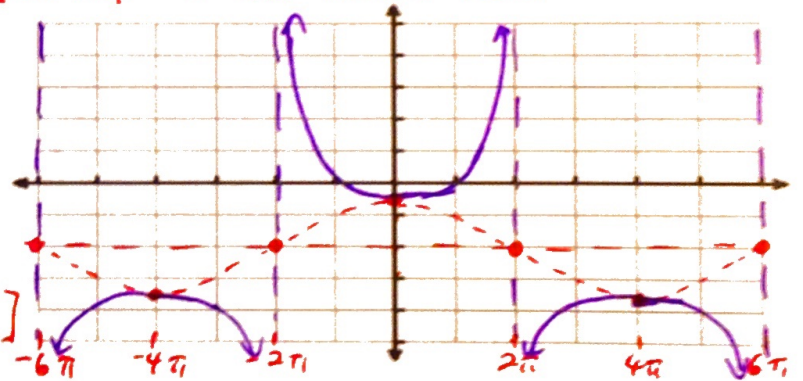
Vertical Shift: -2  
Phase Shift: 0

Amplitude: none

Domain:  $\mathbb{R}$

except  $x \neq 2\pi + 8n\pi$

Range:  $(-\infty, -\frac{7}{2}] \cup [-\frac{1}{2}, \infty)$



8.  $y = 2 - \sec(3x - \pi)$

$y = -\cos 3(x - \frac{\pi}{3}) + 2$  as reference

Period:  $\frac{2\pi}{3}$

Scale:  
1 unit =  $\frac{\pi}{6}$

Vertical Shift: +2  
Phase Shift:  $\frac{\pi}{3}$

Amplitude: none

Domain:  $\mathbb{R}$

except  $x \neq \frac{\pi}{6} + \frac{2}{3}n\pi$

Range:  $(-\infty, 1] \cup [3, \infty)$

