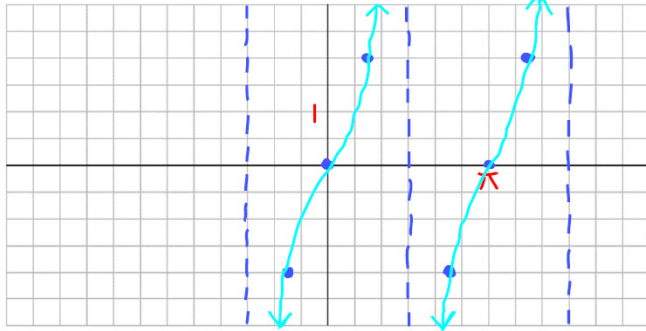


Sketch the graph of the function by hand. Identify the amplitude, period, and phase shift of the graph.

1. $y = 2\tan(x)$



amp 2
 period π
 PS none

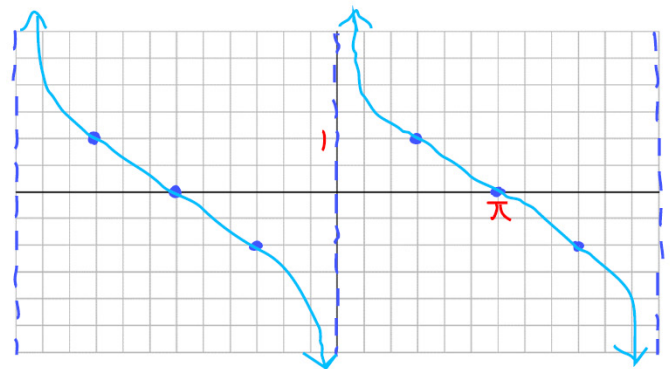
VA
 $x = \frac{\pi}{2}$ or $x = 3\pi/2$

middle pt
 $x = 0$ $y = 2(0)$
 $y = 0$

right pt
 $x = \frac{\pi}{4}$ or $x = 1.5\pi$

$y = 2(1)$
 $y = 2$

2. $y = \cot\left(\frac{x}{2}\right)$



amp 1
 period 2π
 PS none

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

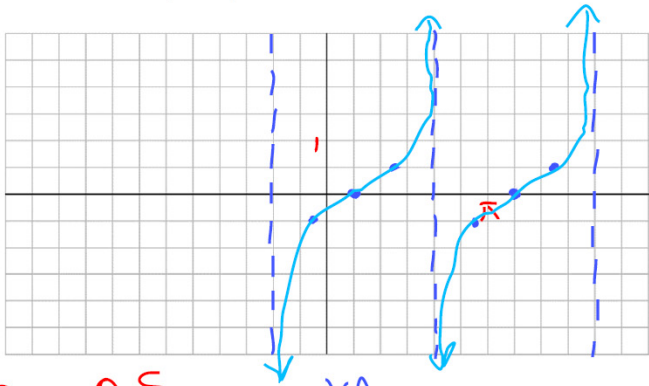
middle pt
 $\frac{x}{2} = \frac{\pi}{2}$ or $\frac{x}{2} = 3$
 $x = \pi$ $x = 6\pi$

$y = 0$

left pt
 $\frac{x}{2} = \frac{\pi}{4}$ or $\frac{x}{2} = 1.5$
 $x = \frac{\pi}{2}$ $x = 3\pi$

$y = 1$

3. $y = 0.5 \tan\left(x - \frac{\pi}{6}\right)$



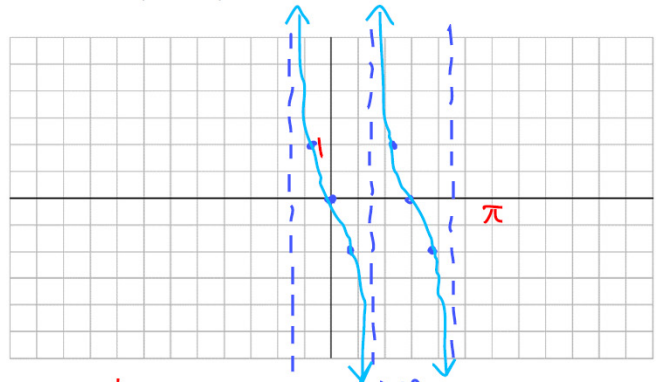
amp 0.5
 period π
 PS $\pi/6$ right

VA
 $x - \frac{\pi}{6} = \frac{\pi}{2}$ or $x - 1 = 3$
 $x = \frac{3\pi}{6} + \frac{\pi}{6}$ $x = 4$
 $x = \frac{2\pi}{3}$

middle pt
 $x - \frac{\pi}{6} = 0$ or $x - 1 = 0$
 $x = \frac{\pi}{6}$ $x = 1$
 $y = 0.5(0)$
 $y = 0$

right pt
 $x - \frac{\pi}{6} = \frac{\pi}{4}$ or $x - 1 = 1.5$
 $x = \frac{3\pi}{12} + \frac{2\pi}{12}$ $x = 2.5$
 $x = \frac{5\pi}{12}$
 $y = 0.5(1)$
 $y = 0.5$

4. $y = \cot\left(2x + \frac{\pi}{2}\right)$



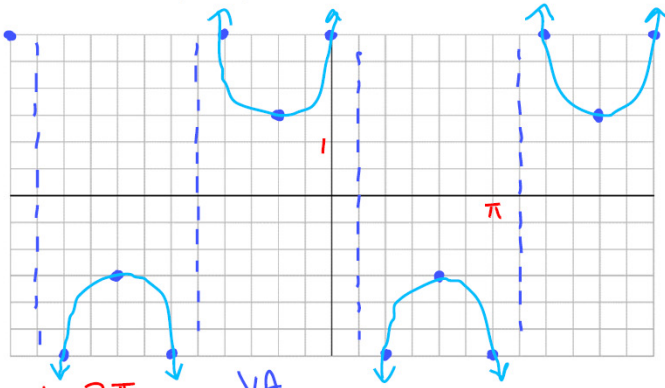
amp 1
 period $\pi/2$
 PS $\pi/4$ left

VA
 $2x + \frac{\pi}{2} = 0$ or $2x + 3 = 0$
 $2x = -\frac{\pi}{2}$ $2x = -3$
 $x = -\frac{\pi}{4}$ $x = -1.5$

middle pt
 $2x + \frac{\pi}{2} = \frac{\pi}{2}$ or $2x + 3 = 3$
 $2x = 0$ $2x = 0$
 $x = 0$ $x = 0$
 $y = 0$

left pt
 $2x + \frac{\pi}{2} = \frac{\pi}{4}$ or $2x + 3 = 1.5$
 $2x = \frac{\pi}{4} - \frac{2\pi}{4}$ $2x = -1.5$
 $2x = -\frac{\pi}{4}$ $x = -0.75$
 $x = -\frac{\pi}{8}$
 $y = 1$

7. $y = 1.5 \sec\left(x + \frac{\pi}{3}\right)$



period 2π
PS $\pi/3$ left

VA
 $x + \frac{\pi}{3} = \frac{\pi}{2}$ or $x + 2 = 3$
 $x = \frac{3\pi}{6} - \frac{2\pi}{6}$ $x = 1$ sq
 $x = \frac{\pi}{6}$

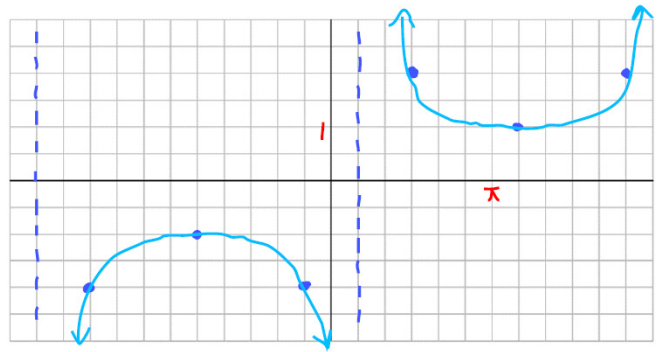
middle pt
 $x + \frac{\pi}{3} = 0$ or $x + 2 = 0$
 $x = -\frac{\pi}{3}$ $x = -2$ sq

$y = 1.5(1)$
 $y = 1.5$

right pt
 $x + \frac{\pi}{3} = \frac{\pi}{3}$ or $x + 2 = 2$
 $x = 0$ $x = 0$ sq

$y = 1.5(2)$
 $y = 3$

8. $y = \csc\left(\frac{x}{2} - \frac{\pi}{12}\right)$



period 4π
PS $\pi/6$ right

VA
 $\frac{x}{2} - \frac{\pi}{12} = 0$ or $\frac{1}{2}x - \frac{1}{2} = 0$
 $\frac{x}{2} = \frac{\pi}{12}$ $\frac{1}{2}x = \frac{1}{2}$
 $x = \frac{\pi}{6}$ $x = 1$ sq

middle pt
 $\frac{x}{2} - \frac{\pi}{12} = \frac{\pi}{2}$ or $\frac{1}{2}x - \frac{1}{2} = 3$
 $\frac{x}{2} = \frac{6\pi}{12} + \frac{\pi}{12}$ $x - 1 = 6$
 $x = 7$ sq

$\frac{x}{2} = \frac{7\pi}{12}$ $y = 1$
 $x = \frac{7\pi}{6}$

left pt
 $\frac{x}{2} - \frac{\pi}{12} = \frac{\pi}{6}$ or $\frac{1}{2}x - \frac{1}{2} = 1$
 $\frac{x}{2} = \frac{2\pi}{12} + \frac{\pi}{12}$ $x - 1 = 2$
 $x = 3$ sq

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