Arroyo P.6 5/13/22

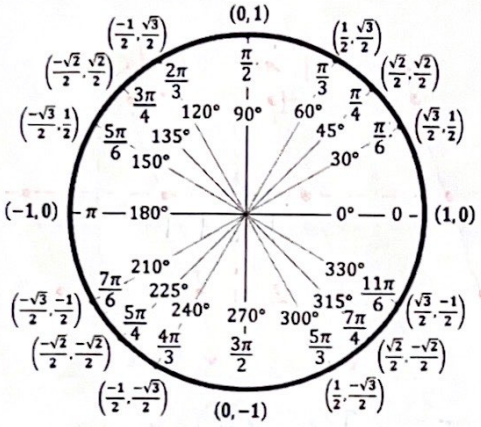
A73: Graphing Tangent

Notes: 34.4 Tangent Graph

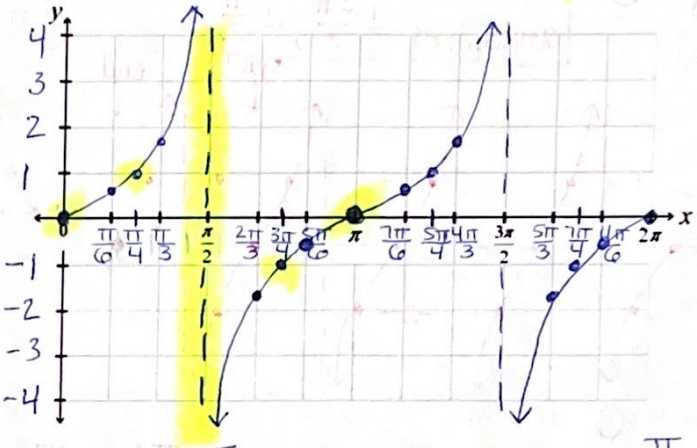
Note: $\frac{1/2}{\sqrt{3}/2} = \sqrt{3}/3 = 0.6$ & $\frac{\sqrt{3}/2}{1/2} = \sqrt{3} = 1.7$

"Unwrapping" Tangent from the Unit Circle:

On the Unit Circle: $\tan\theta = \frac{y}{x}$



On the Tangent Graph: $x = \theta$ from Unit Circle & $y = \tan\theta = \frac{\sin\theta}{\cos\theta}$



Period: $T = \pi$ Midline: $y = 0$ Asymptotes: $x = \frac{\pi}{2}, \frac{3\pi}{2}$

Key Points: $(0, 0)$ $(\frac{\pi}{4}, 1)$ $(\frac{\pi}{2}, \text{undefined})$ $(\frac{3\pi}{4}, -1)$ $(\pi, 0)$

Transformations with Tangent:

$$y = A\tan\big(B(x - C)\big) + D$$

- A – NOT called amplitude for Tangent: the distance from the midline to the key points is **A** *OR* multiply the y-values by A
- B – Period: the length of one full cycle (or period) is $T = \frac{\pi}{B}$ *OR* multiply the x-values by $\frac{1}{B}$
- C – Phase shift: the new "beginning/start" of the period is $x = C$ *OR* move the graph C units left/right
- D – Midline: the line that splits the graph in half horizontally goes through $y = D$ *OR* move the graph D units up/down

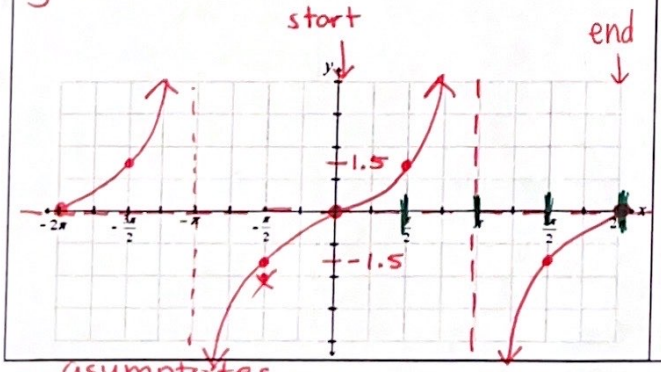
Graph and identify the location of the asymptotes.

1. $y = \frac{3}{2}\tan\left(\frac{1}{2}x\right) + 0$

$T = \frac{\pi}{1/2} = 2\pi$ $T/4 = \frac{2\pi}{4} = \frac{\pi}{2}$ ← step

$A = 1.5$ $x = 0$ ← start

$y = 0$ ← midline



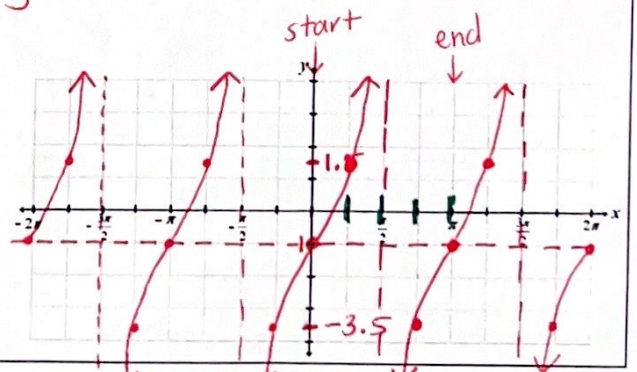
asymptotes $x = -\pi, \pi$

2. $y = \frac{5}{2}\tan x - 1$

$T = \pi$ $T/4 = \pi/4$

$A = 2.5$ $x = 0$

$y = -1$



asymptotes: $x = \frac{-3\pi}{2}, \frac{-\pi}{2}, \frac{\pi}{2}, \frac{3\pi}{2}$

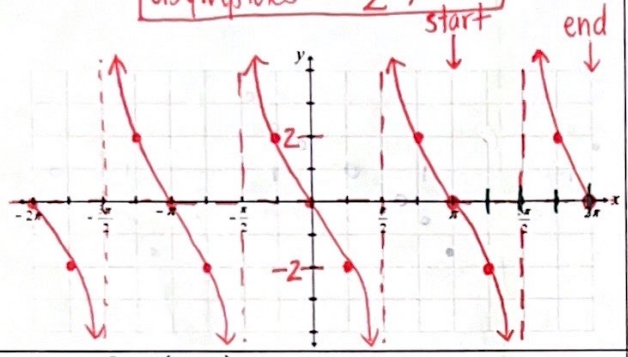
3. $y = -2\tan(x - \pi)$

$T = \pi$ $\quad T/4 = \pi/4$ $\quad x = \pi$

$A = 2$

$y = 0$

asymptotes: $\pm\frac{3\pi}{2}, \pm\frac{\pi}{2}$



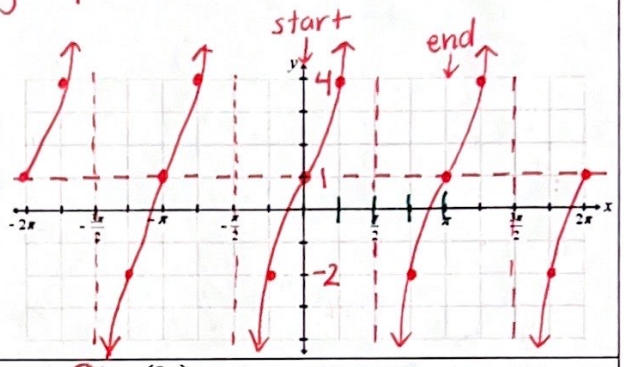
4. $y = 3\tan x + 1$

$T = \pi$ $\quad T/4 = \pi/4$ $\quad x = 0$

$A = 3$

$y = 1$

asymptotes: $\pm\frac{3\pi}{2}, \pm\frac{\pi}{2}$



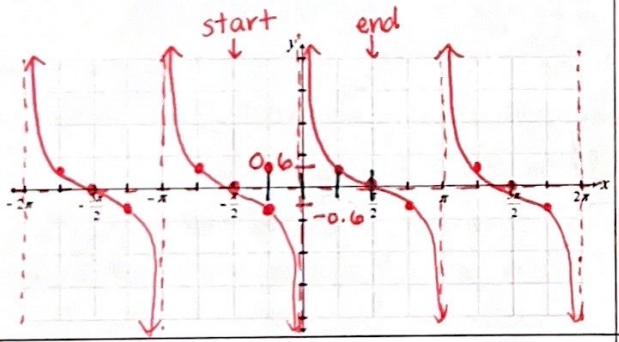
5. $y = -\frac{2}{3}\tan\left(x + \frac{\pi}{2}\right)$

$T = \pi$ $\quad T/4 \neq \pi/4$ $\quad x = -\pi/2$

$A = .6$

$y = 0$

asymptotes: $\pm 2\pi, \pm\pi, 0$



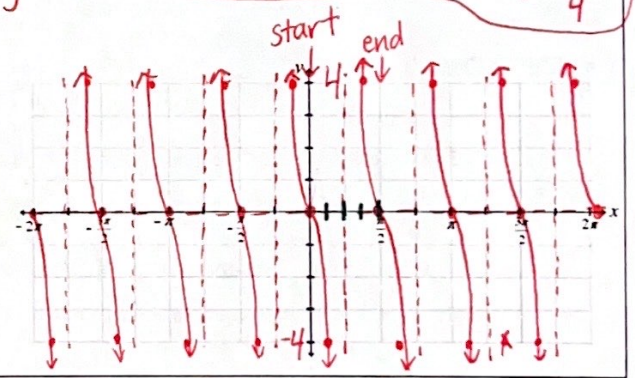
6. $y = -4\tan(2x)$

$T = \frac{\pi}{2}$ $\quad T/4 = \frac{T/2}{4} = \frac{\pi}{8}$ $\quad x = 0$

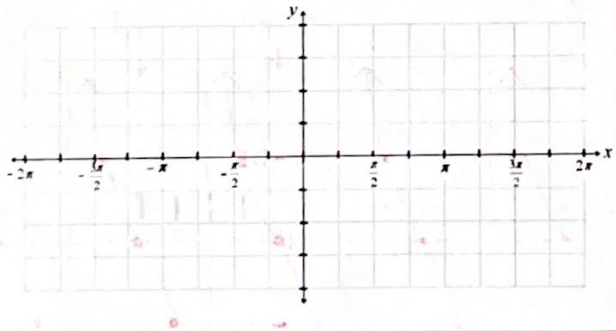
$A = 4$

$y = 0$

asymptotes: $x = \pm\frac{\pi}{4}, \pm\frac{3\pi}{4}, \pm\frac{5\pi}{4}, \pm\frac{7\pi}{4}$



7. $y = 2\tan\left(\frac{1}{4}x\right) - 2$



8. $y = -\frac{1}{4}\tan(2x) + 3$