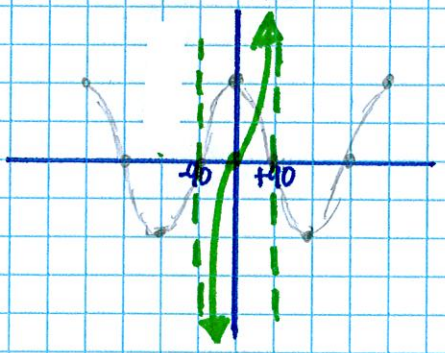
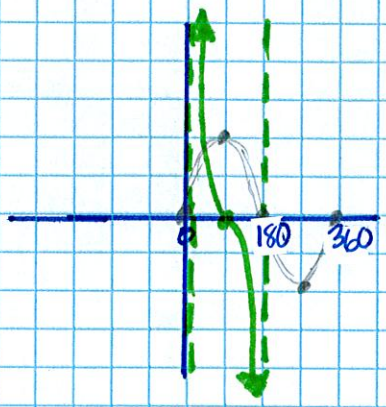
Notes: Tangent / Cotangent - Graphing

Parent Functions





$f(x) = \tan x = \frac{\sin x}{\cos x}$

- Period = 180° OR π
- Vertical Asymptotes
  - you set $bx + c = -90$ OR $bx + c = +90^\circ$
  - $bx + c = -\frac{\pi}{2}$ OR $bx + c = +\frac{\pi}{2}$

$f(x) = a\tan(bx + c) + d$

$f(x) = \cot x = \frac{\cos x}{\sin x}$

- Period = 180° OR π
- Vertical Asymptotes
  - you set $bx + c = 0$ OR $bx + c = 180$
  - $bx + c = 0$ OR $bx + c = \pi$

$f(x) = a\cot(bx + c) + d$

Example 1 graph $f(x) = \overset{a=2}{2}\tan(\overset{b=1}{1}x - \overset{c=-90}{90^\circ}) + \overset{d=3}{3}$

Period: $\frac{180}{b} = \frac{180}{1} = 180^\circ$

Vertical Shift: up 3

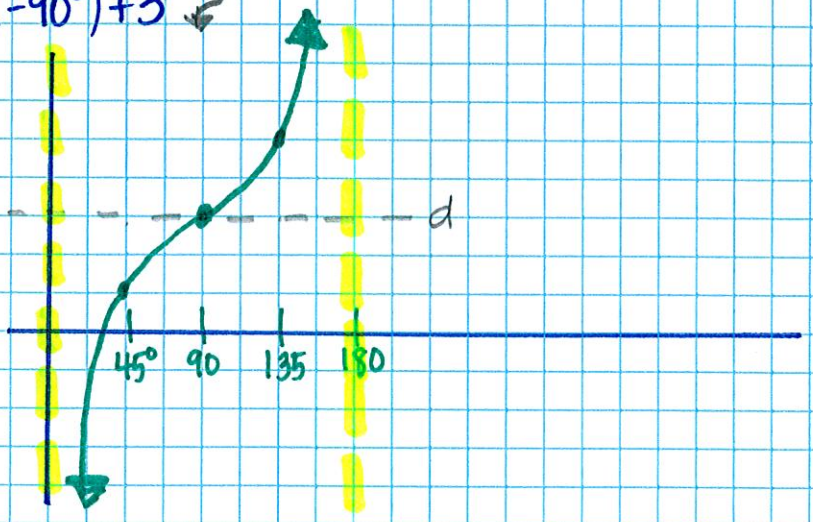
~~Horizontal Shift~~:

Start: $bx + c = -90$, $x = 0$

End: $bx + c = +90$, $x = 180^\circ$

Increments: $\frac{P}{4} = \frac{180}{4} = 45^\circ$

x	y
0°	VA
45°	1
90°	3
135°	5
180°	VA



Example 2 $f(x) = +3\cot\left(\frac{1}{2}x - 45^\circ\right) + 1$

Period: $\frac{180}{b} = \frac{180}{\frac{1}{2}} = 360^\circ$

Vertical Shift: up 1

Horizontal Shift:

Start: $\frac{1}{2}x - 45^\circ = 0$

$2\left(\frac{1}{2}x\right) = (45)2 \quad x = 90^\circ$

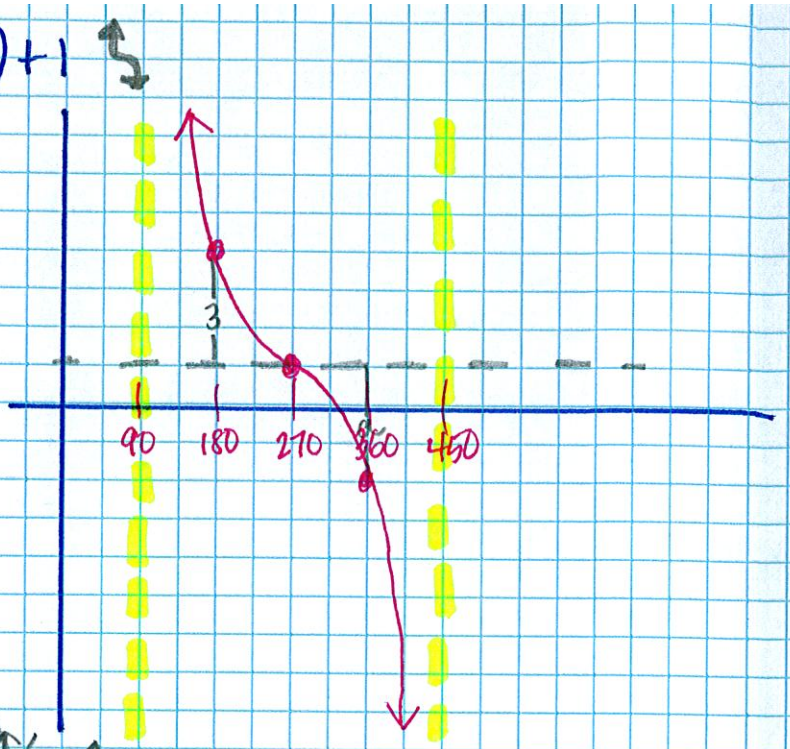
End: $\frac{1}{2}x - 45^\circ = 180$

$2\left(\frac{1}{2}x\right) = (225)2 \quad x = 450^\circ$

Increments:

$\frac{P}{4} = \frac{360}{4} = 90^\circ$

x	y
90	VA
180	4
270	1
360	-2
450	VA



Example 3 $f(x) = -2\cot(2x + \pi) - 3$

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

Vertical Shift: down 3

Horizontal Shift:

Start: $2x + \pi = 0$

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

End: $2x + \pi = \pi$

$2x = 0 \quad x = 0$

Increments:

$\frac{P}{4} = \frac{\frac{\pi}{2}}{4} \cdot \frac{1}{1} = \frac{\pi}{8}$

x	y
$-\frac{\pi}{2}$	VA
$-\frac{3\pi}{8}$	-5
$-\frac{\pi}{4}$	-3
$-\frac{\pi}{8}$	-1
0	VA

$-\frac{4\pi}{42} + \frac{\pi}{8} = -\frac{3\pi}{8}$

$-\frac{3\pi}{8} + \frac{\pi}{8} = -\frac{2\pi}{8} = -\frac{\pi}{4}$

$-\frac{2\pi}{8} + \frac{\pi}{8} = -\frac{\pi}{8}$

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

$\cancel{x}$ - because neg.