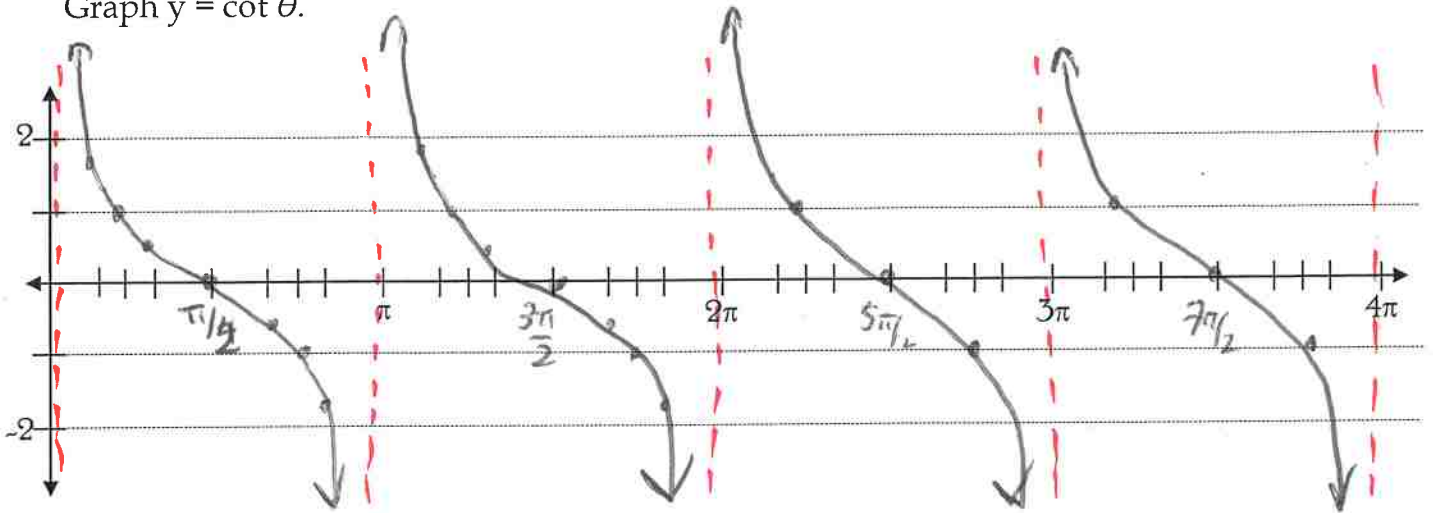


## 2.10: Exploring the Cotangent & Tangent Graphs

Date \_\_\_\_\_

Radians	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{3\pi}{4}$	$\frac{5\pi}{6}$	$\pi$	$\frac{7\pi}{6}$	$\frac{5\pi}{4}$	$\frac{4\pi}{3}$	$\frac{3\pi}{2}$	$\frac{5\pi}{3}$	$\frac{7\pi}{4}$	$\frac{11\pi}{6}$	$2\pi$
cot $\theta$ (exact)	und.	$\sqrt{3}$	1	$\frac{\sqrt{3}}{3}$	0	$-\frac{\sqrt{3}}{3}$	-1	$-\sqrt{3}$	und.	$\sqrt{3}$	1	$\frac{\sqrt{3}}{3}$	0	$-\frac{\sqrt{3}}{3}$	-1	$-\sqrt{3}$	und.
cot $\theta$ (decimal)	und.	1.73	1	0.577	0	-0.577	-1	-1.73	und.	1.73	1	0.577	0	-0.57	-1	-1.73	und.

Graph  $y = \cot \theta$ .



The period of  $y = \cot \theta$  is  $\pi$

The domain of  $y = \cot \theta$  is  $\mathbb{R}$  except  $x = n\pi$  where  $n \in \mathbb{Z}$

The range of  $y = \cot \theta$  is  $(-\infty, \infty)$

1. Graph  $y = 5 \cot \theta - 1$

Vertical Stretch: 5

Period:  $\pi$

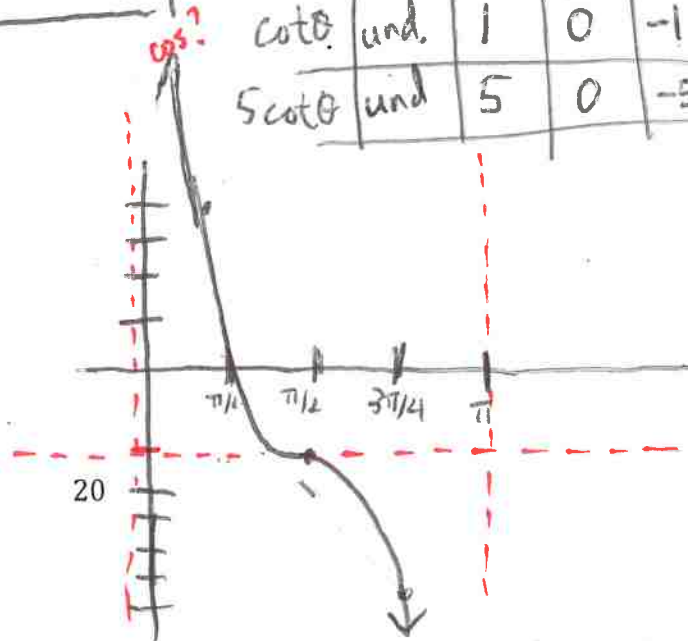
Phase Shift: none

Vertical Shift: down 1

$$I = \frac{1}{4}P = \frac{1}{4} \cdot \pi = \frac{\pi}{4}$$

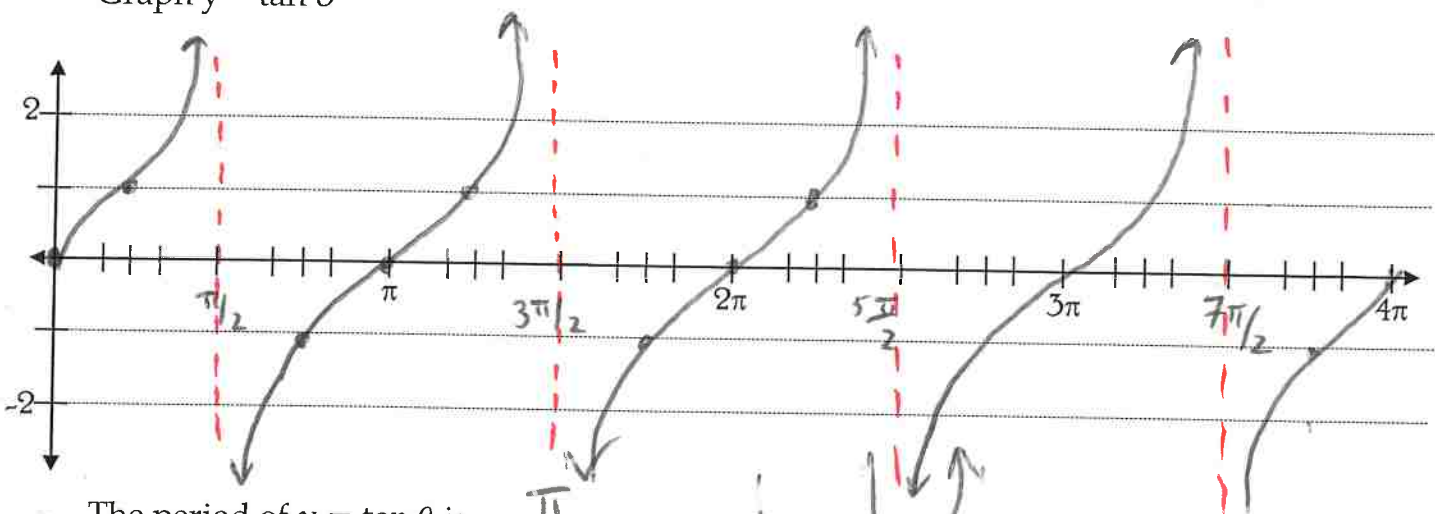
\* period =  $\frac{\pi}{b}$

$\theta$	0	$\frac{\pi}{4}$	$\frac{\pi}{2}$	$\frac{3\pi}{4}$	$\pi$
$\cot \theta$	und.	1	0	-1	und.
$5 \cot \theta$	und.	5	0	-5	und.



Radians	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{3\pi}{4}$	$\frac{5\pi}{6}$	$\pi$	$\frac{7\pi}{6}$	$\frac{5\pi}{4}$	$\frac{4\pi}{3}$	$\frac{3\pi}{2}$	$\frac{5\pi}{3}$	$\frac{7\pi}{4}$	$\frac{11\pi}{6}$	$2\pi$
$\tan \theta$ (exact)	0		1		und.		-1		0		1		und.		-1		0
$\tan \theta$ (decima l)	0		1		und.		-1		0		1		und.		-1		0

Graph  $y = \tan \theta$



The period of  $y = \tan \theta$  is  $\pi$

Practice: Graph one period of tangent.

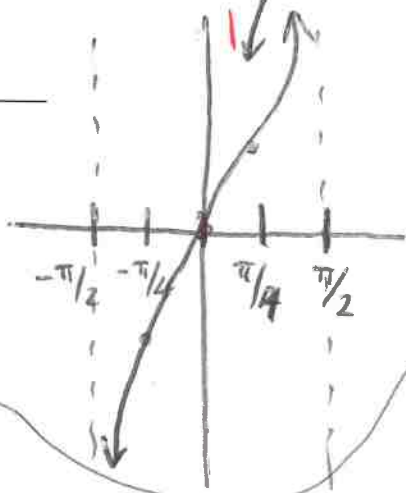
2.  $y = \tan\left(\frac{\theta}{2} - \frac{3\pi}{4}\right)$

Vertical Stretch: \_\_\_\_\_

Period: \_\_\_\_\_

Phase Shift: \_\_\_\_\_

Vertical Shift: \_\_\_\_\_



$\theta$	$-\pi/2$	$-\pi/4$	0	$\pi/4$	$\pi/2$
$\tan \theta$	und.	-1	0	1	und.

$a = -2$        $c = \pi/12$

$b = 3$        $d = -1$

$\ast \text{ period} = \frac{\pi}{b} \rightarrow \frac{\pi}{3}$

3.  $y = -2 \tan\left(3\theta - \frac{\pi}{4}\right) - 1$

Vertical Stretch: \_\_\_\_\_

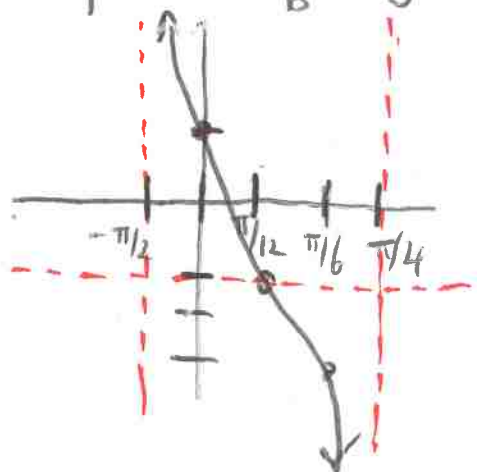
Period: \_\_\_\_\_

Phase Shift: \_\_\_\_\_

Vertical Shift: \_\_\_\_\_

$I = \frac{1}{4} \cdot \frac{\pi}{3} = \frac{\pi}{12}$

$\theta$	$\frac{2\pi}{12}$	$\frac{\pi}{12} + \frac{\pi}{12}$	0	$\frac{\pi}{12}$	$\frac{2\pi}{12} + \frac{\pi}{12}$
$\tan 3\theta$	und.	-1	0	1	und.
$-2 \tan 3\theta$	und.	2	0	-2	und.



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

Per:  $\frac{\pi}{4}$  PS: right  $\frac{\pi}{8}$  VS: up 2

$y = \cot\left[4\left(\theta - \frac{\pi}{8}\right)\right] + 2$

$a=1$   $c=\frac{\pi}{8}$   
 $b=4$   $d=2$

\*period =  $\frac{\pi}{b}$

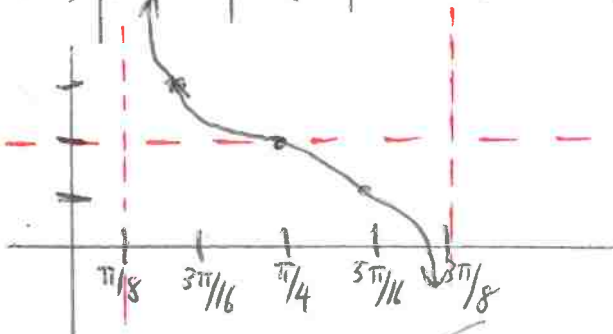
period =  $\frac{\pi}{4}$

$I = \frac{1}{4} \cdot P \rightarrow \frac{1}{4} \cdot \frac{\pi}{4} = \frac{\pi}{16}$

6.  $y = -\cot\left(3\theta + \frac{\pi}{2}\right) + 1$

Per: PS: VS:

$\theta$	$0 + \frac{\pi}{8}$	$\frac{\pi}{16} + \frac{\pi}{8}$	$\frac{2\pi}{16} + \frac{\pi}{8}$	$\frac{3\pi}{16} + \frac{\pi}{8}$	$\frac{4\pi}{16} + \frac{\pi}{8}$
$\cot(4\theta)$	und	1	0	-1	und
$\cot(4\theta)$	und	1	0	-1	und



7.  $y = 2 \tan\left(\frac{\theta}{2} - \frac{\pi}{2}\right) - 3$

Per: PS: right  $\pi$  VS: down 3

$y = 2 \tan\left[\frac{1}{2}\left(\theta - \pi\right)\right] - 3$

$a=2$   $b=\frac{1}{2}$   $c=-\pi$   $d=-3$

period =  $\frac{\pi}{b} = \frac{\pi}{1/2} = 2\pi$

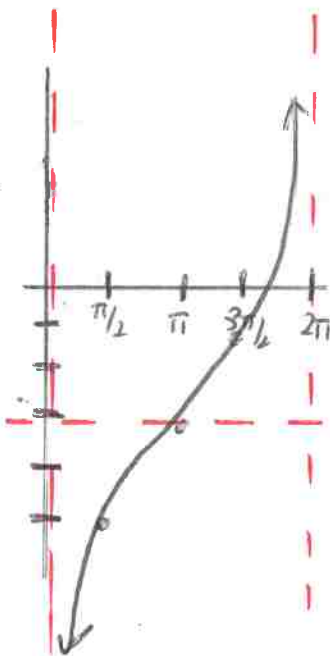
$I = \frac{1}{4} \cdot P = \frac{1}{4} \cdot 2\pi = \frac{\pi}{2}$

8.  $y = -3 \cot(2\theta + 3\pi) + 5.5$

Per: PS: VS:

$\theta$	$-\pi + \pi$	$-\frac{\pi}{2} + \pi$	$0 + \pi$	$\frac{\pi}{2} + \pi$	$\pi + \pi$
$\tan\theta$	und	-1	0	1	und
$2 \tan\theta$	und	-2	0	2	und

period =  $\frac{\pi}{b}$



Write an equation for each function described.

9. Tangent function, period =  $3\pi$ , phase shift left  $\frac{\pi}{4}$ , and vertical shift down 6

$\frac{3\pi}{1} = \frac{\pi}{b} \mid 3\pi b = \pi \mid b = \frac{\pi}{3\pi} = \frac{1}{3} \mid a=1 \mid c = \frac{\pi}{4} \mid d = -6 \mid y = \tan\left[\frac{1}{3}\left(\theta + \frac{\pi}{4}\right)\right] - 6$

10. Cotangent function, period =  $\frac{\pi}{4}$ , phase shift right  $\frac{\pi}{2}$ , and vertical shift up 9

$\frac{\pi}{4} = \frac{\pi}{b} \mid b = \frac{4\pi}{\pi} \mid c = -\frac{\pi}{2} \mid d = 9 \mid y = \cot\left[4\left(\theta - \frac{\pi}{2}\right)\right] + 9$