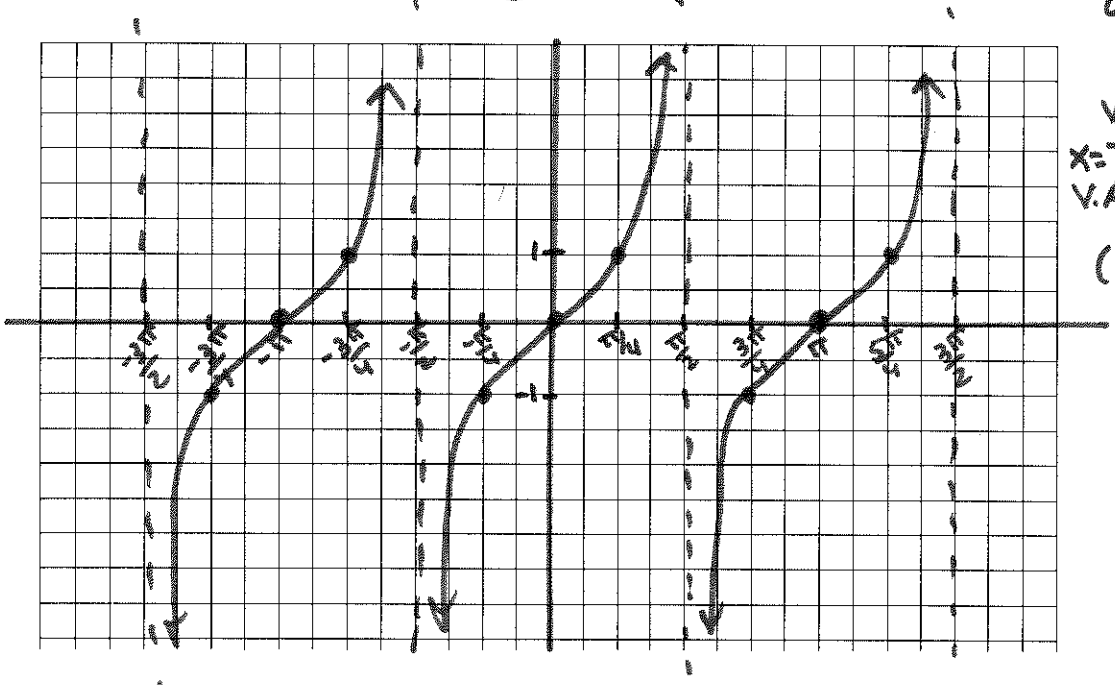
4.5 Graphs of Other Trigonometric Functions

Evaluate $y = \tan\theta$ for the multiples of $\frac{\pi}{4}$ in the interval $\frac{-3\pi}{2} \le \theta \le \frac{3\pi}{2}$

θ	$\frac{-3\pi}{2}$	$\frac{-5\pi}{4}$	$-\pi$	$\frac{-3\pi}{4}$	$\frac{-\pi}{2}$	$\frac{-\pi}{4}$	0	$\frac{\pi}{4}$	$\frac{\pi}{2}$	$\frac{3\pi}{4}$	π	$\frac{5\pi}{4}$	$\frac{3\pi}{2}$
Tan θ $\frac{y}{x}$	undef.	-1	0	1	undef.	-1	0	1	undef.	-1	0	1	undef.

one per. tan θ

Graph $y = \tan\theta$



one period of tan θ
V.A to V.A
$x = -\frac{\pi}{2}$ to $x = \pi/2$
V.A. -1 0 1 V.A
(5 critical values are V.A.s and points)

Properties of the graph of $y = \tan\theta$

1. The period is π.

2. The domain is the set of real numbers except $\frac{\pi}{2}n$, where n is an odd integer.

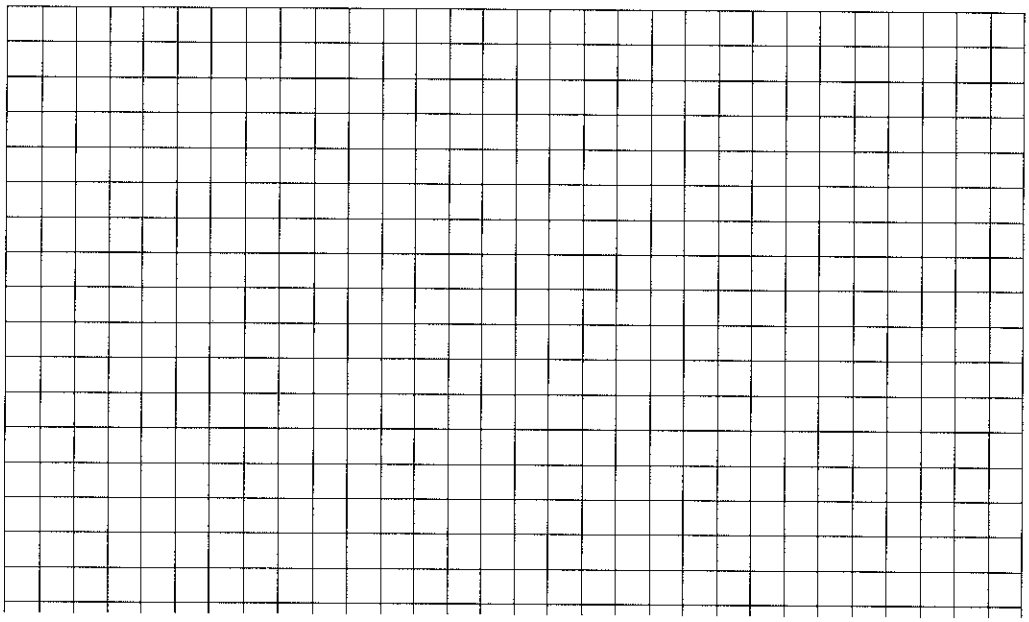
3. The range is the set of real numbers. $(-\infty, \infty)$

4. The x intercepts are located at πn, where n is an integer.

5. The y intercept is (0, 0).

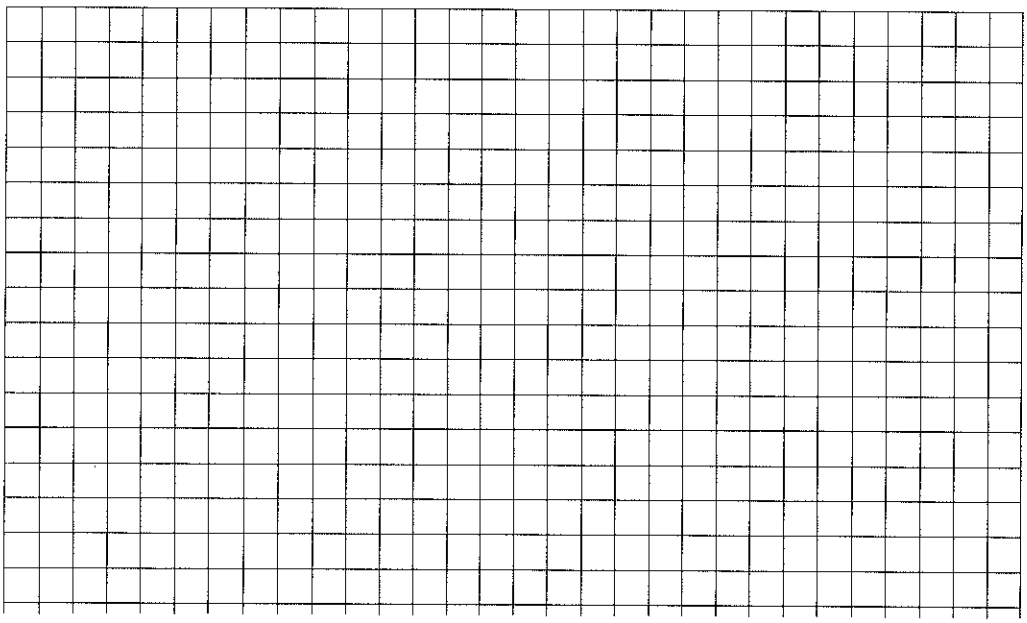
6. The vertical asymptotes are $x = \frac{\pi}{2}n$, where n is an odd integer.

Ex: 1 Sketch the graph of $y = \tan\frac{x}{2}$ for 2 cycles of output values.



x	y

Ex: 2 Sketch the graph of $y = -3\tan(2x)$ for 2 cycles of output values.

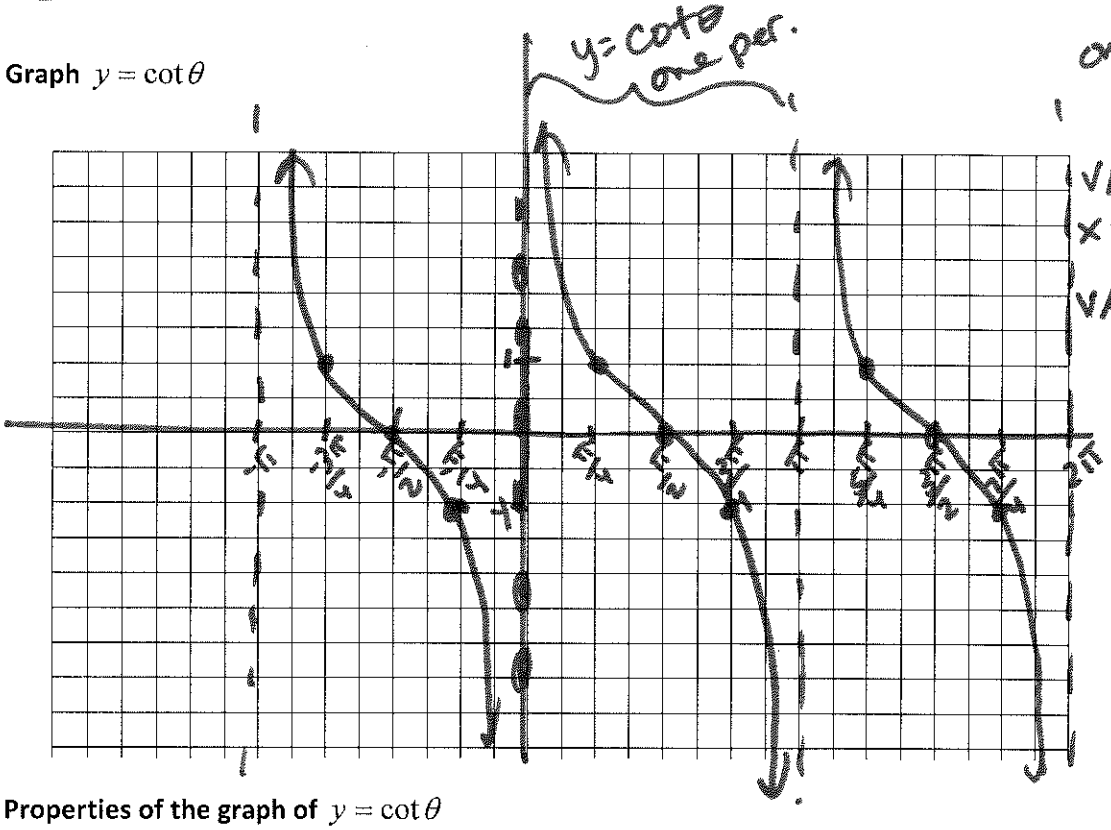


x	y

Evaluate $y = \cot\theta$ in the interval $-\pi \le \theta \le 2\pi$

θ	$-\pi$	$\frac{-3\pi}{4}$	$\frac{-\pi}{2}$	$\frac{-\pi}{4}$	0	$\frac{\pi}{4}$	$\frac{\pi}{2}$	$\frac{3\pi}{4}$	π	$\frac{5\pi}{4}$	$\frac{3\pi}{2}$	$\frac{7\pi}{4}$	2π
$\cot\theta$	undef	1	0	-1	undef	1	0	-1	undef	1	0	-1	undef

Graph $y = \cot\theta$



Properties of the graph of $y = \cot\theta$

1. The period is _____.

2. The domain is the set of real numbers except πn, where n is an integer.

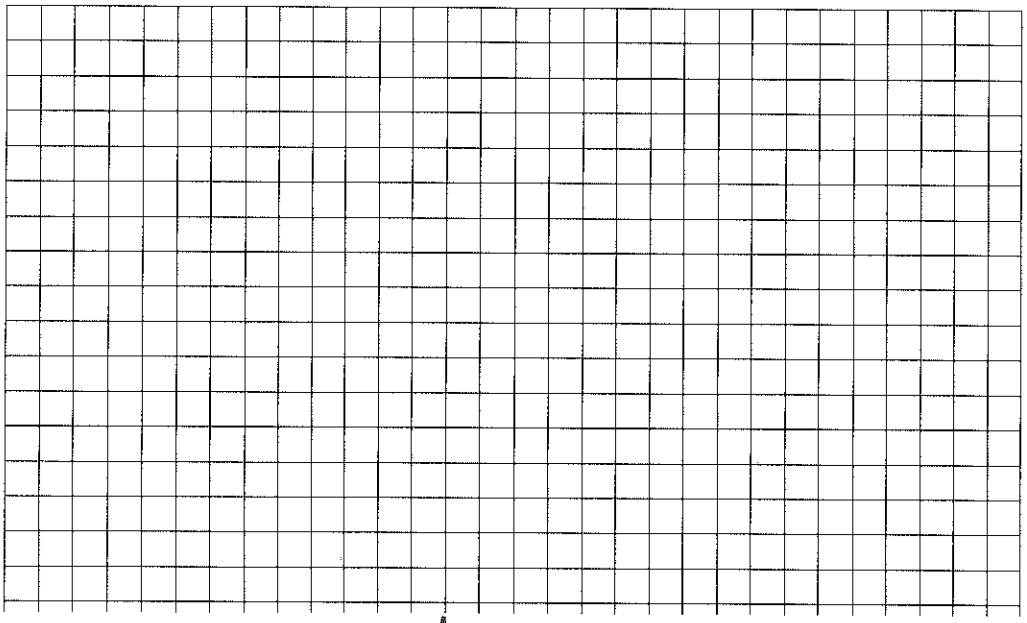
3. The range is the set of real numbers.

4. The x intercepts are located at $\frac{\pi}{2}n$, where n is an odd integer.

5. There is no y intercept.

6. The asymptotes are $x = \pi n$, where n is an integer.

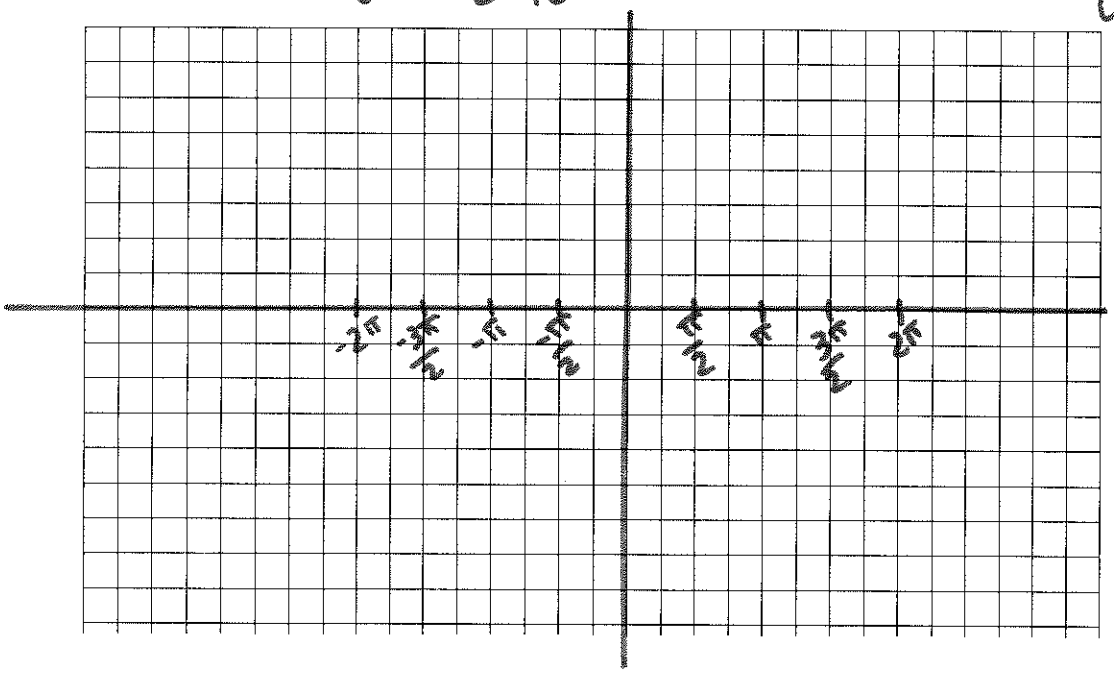
Ex: 3 Sketch the graph of $y = 2\cot\left(\frac{x}{3}\right)$ for 2 cycles of output values.



x	y

Graph $y = \csc\theta$

$y = \frac{1}{\sin\theta}$



use pencil to draw sinθ

sinθ → cscθ

intersect → V.A.

incr → decr

decr → incr

1 → 1

-1 → -1

erase sinθ

Properties of the graph of $y = \csc\theta$.

1. The period is 2π.
2. The domain is the set of real numbers except πn, where n is an integer.
3. The range is $(-\infty,-1]\cup[1,\infty)$.
4. There is no x intercept.
5. There is no y intercept.
6. The vertical asymptotes are $x = \pi n$, where n is an integer.
7. y = 1 when $x = \frac{\pi}{2} + 2\pi n$, where n is an integer.
8. y = -1 when $x = \frac{3\pi}{2} + 2\pi n$, where n is an integer.

Graph $y = \sec\theta$.

$y = \frac{1}{\cos\theta}$

use pencil to draw $\cos\theta$

For reciprocal: $\cos\theta \rightarrow \sec\theta$

intersect → V.A

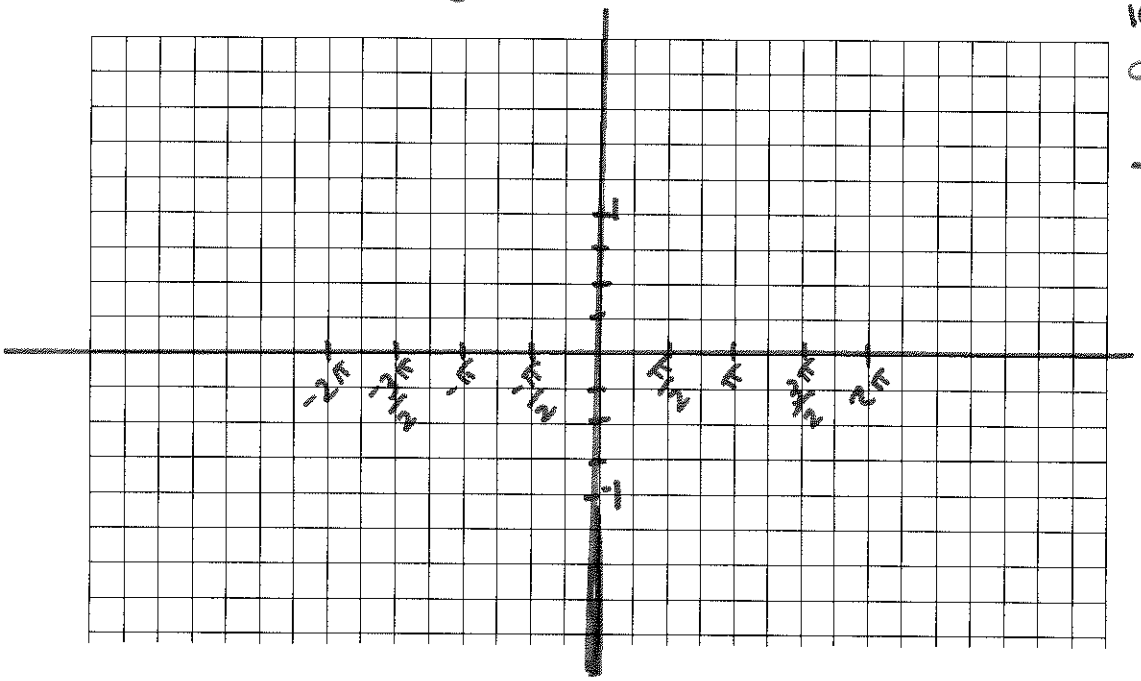
incr → decr

decr → incr

1 → 1

-1 → -1

erase $\cos\theta$



Properties of the graph of $y = \sec\theta$.

1. The period is 2π.

2. The domain is the set of real numbers except $\frac{\pi}{2}n$, where n is an odd integer.

3. The range is $(-\infty,-1]\cup[1,\infty)$.

4. There is no x intercept.

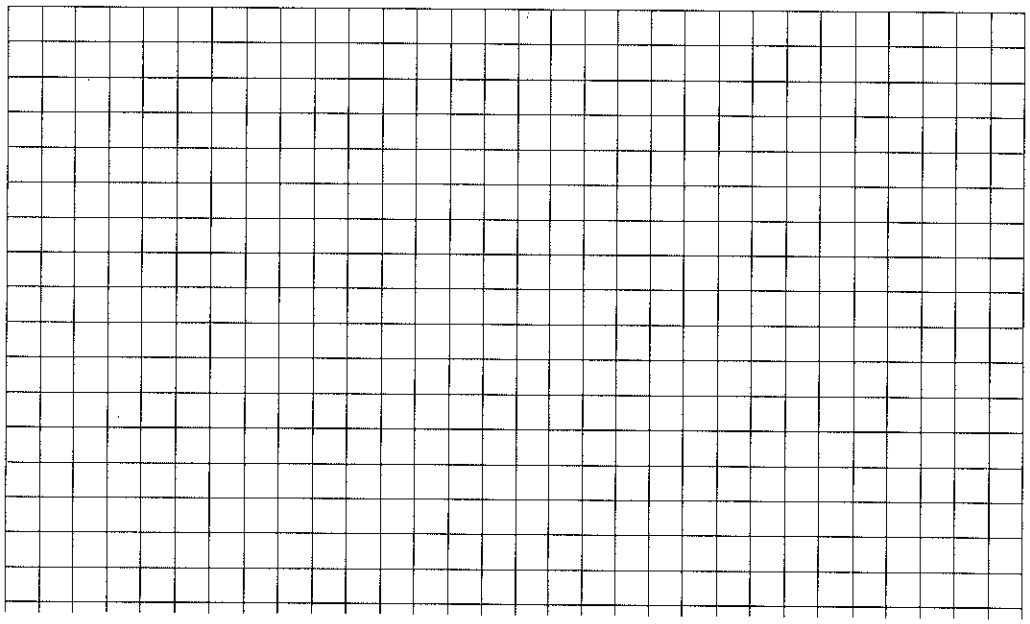
5. The y intercept is (0,1).

6. The vertical asymptotes are $x = \frac{\pi}{2}n$, where n is an odd integer.

7. y = 1 when $x = \pi n$, where n is an even integer.

8. y = -1 when $x = \pi n$, where n is an odd integer.

Ex: 4 Sketch the graph of $y = 2\csc\left(x + \frac{\pi}{4}\right)$ for 2 cycles of output values.



Ex: 5 Sketch the graph of $y = \sec(2x)$ for 2 cycles of output values.