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Graphs & Inverses of Trig Functions
4 – Graphing Tangent & Cotangent

Periodic Function
A function in which for some real number α, $f(x + \alpha) = f(x)$ for each x in the domain of f.

$$y = A\tan\left[K(\theta - PS)\right] + VD$$

$$y = A\cot\left[K(\theta - PS)\right] + VD$$

A
A = the coefficient of the trig function. This determines the vertical stretching and shrinking of a graph. It also determines if the graph is reflected over the midline.

~~Amplitude~~
~~Amplitude of Sine and Cosine = $|A|$ = half the distance between the minimum and maximum values of the range of a periodic function with a bounded range.~~

Vertical Displacement
VD = the vertical translation

Midline
The horizontal axis used as the reference line about which the graph of a periodic function oscillates.

Period
P = the horizontal length of the unique part of the graph.

Phase Shift
PS = the horizontal translation.

Domain for trig functions
all the angles that can be put into the function (all the numbers included from left to right).

Range for trig functions
all the values that come out of the function (all the numbers included from bottom to top).

How to determine all the important things…

$y = A\tan\left[K(\theta - PS)\right] + VD$

A: A
~~Amplitude~~:
Reflected over midline?

Vertical Displacement: VD
Midline: $y = VD$

Phase Shift: PS

Period: $\frac{180^\circ}{K}$

$y = A\cot\left[K(\theta - PS)\right] + VD$

A: A
~~Amplitude~~:
Reflected over midline?

Vertical Displacement: VD
Midline: $y = VD$

Phase Shift: PS

Period: $\frac{\pi}{K}$

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Graphs & Inverses of Trig Functions

4 – Graphing Tangent & Cotangent

State the essentials for each function.

#1) $y = 10\tan\left(\frac{1}{2}\theta - 45°\right) + 3$

$y = 10\tan\left[\frac{1}{2}(\theta - 90°)\right] + 3$

A: 10

~~Amplitude:~~

Reflected over midline? NO

Vertical Displacement: 3

Midline: $y = 3$

Phase Shift: $90°$

Period: $\frac{180°}{\frac{1}{2}} = 360°$

$y = -243\cot\left[\frac{1}{3}\left(\theta + \frac{3\pi}{4}\right)\right] - 2$

#2) $y = -243\cot\left(\frac{1}{3}\theta + \frac{\pi}{4}\right) - 2$

A: -243

~~Amplitude:~~

Reflected over midline? yes

Vertical Displacement: -2

Midline: $y = -2$

Phase Shift: $\frac{-3\pi}{4}$

Period: $\frac{\pi}{\frac{1}{3}} = 3\pi$

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Graphs & Inverses of Trig Functions
4 – Graphing Tangent & Cotangent

Write an equation of the tangent function with the given information.

#1) A = 3, period = 720°, phase shift = 60°, VD = 2

$y = 3\tan\left[\frac{1}{4}(\theta - 60^\circ)\right] + 2$

$720^\circ K = 180^\circ$
$K = \frac{1}{4}$

Start with a compound inequality

(phase shift)° ≤ θ ≤ (phase shift + period)°.

Use your algebra skills to change the equation so it is in the form 0° ≤ β ≤ p°.
p = period of parent

The answer will be of this form:
$y = \pm Amp\sin(\beta) + VD$

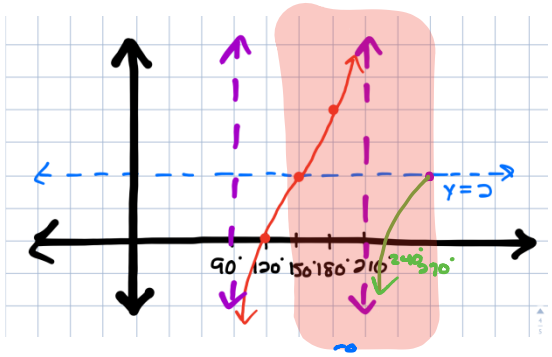
Write an equation of the cotangent function with the given information.

#1) A = -1, period = 4π, phase shift = $-\frac{\pi}{2}$, VD = 0

$y = -\cot\left[\frac{1}{4}\left(\theta + \frac{\pi}{2}\right)\right]$

$4\pi K = \pi$
$K = \frac{1}{4}$

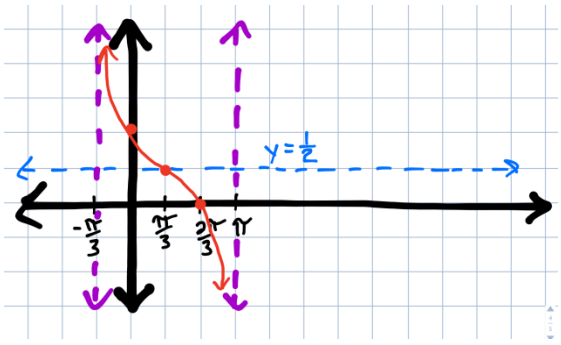
#2)



$y = 2\tan\left[\frac{3}{2}(\theta - 150^\circ)\right] + 2$

$120^\circ K = 180^\circ$
$K = \frac{180}{120}$
$K = \frac{3}{2}$

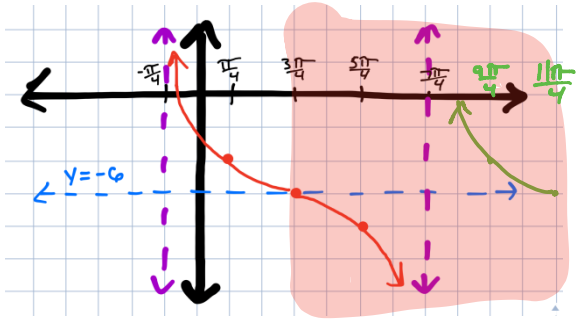
#2)



$y = -\frac{1}{2}\cot\left[\frac{3}{4}\left(\theta + \frac{\pi}{3}\right)\right] + \frac{1}{2}$

$\frac{4\pi}{3}K = \pi$
$K = \pi\frac{3}{4\pi}$
$K = \frac{3}{4}$

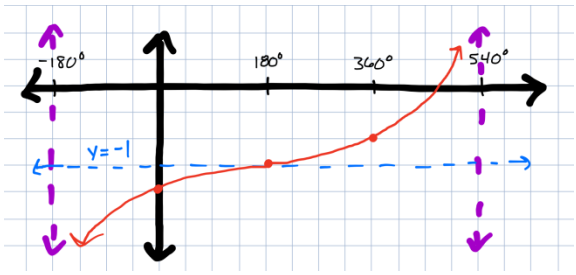
#3)



$y = -\tan\left[\frac{1}{2}\left(\theta - \frac{3\pi}{4}\right)\right] - 6$

$2\pi K = \pi$
$K = \frac{1}{2}$

#3)



$y = \frac{1}{3}\cot\left[\frac{1}{4}(\theta + 180^\circ)\right] - 1$

$720^\circ K = 180^\circ$
$K = \frac{1}{4}$

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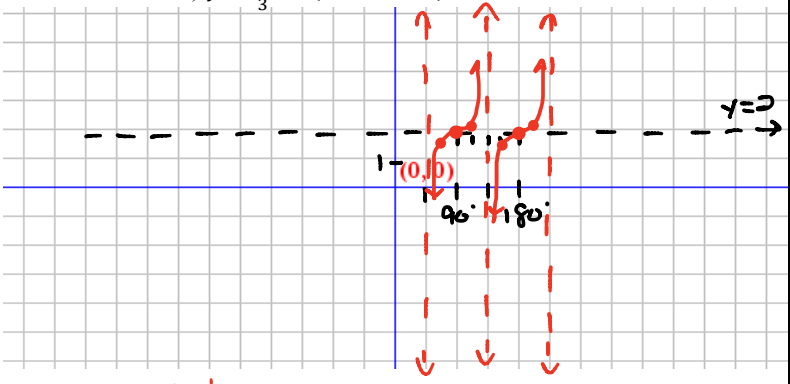
Graphs & Inverses of Trig Functions

4 – Graphing Tangent & Cotangent

Graph at least two periods each function.

$y = \frac{1}{3}\tan[2(\theta - 90°)] + 2$

#1) $y = \frac{1}{3}\tan(2\theta - 180°) + 2$



A: $\frac{1}{3}$

~~Amplitude:~~

Reflected over x-axis? NO

Vertical Displacement: 2

Midline: $y = 2$

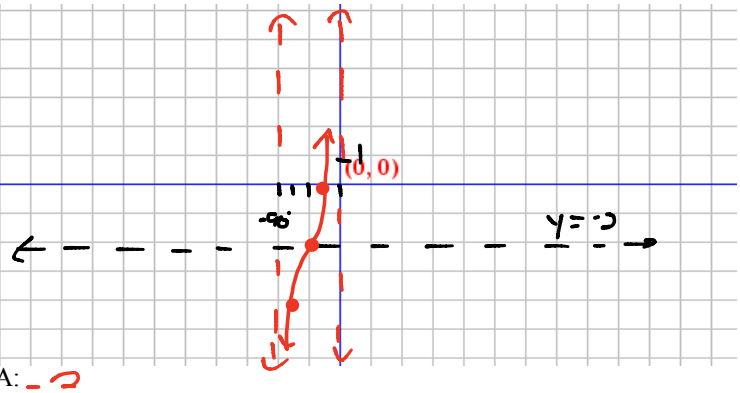
Phase Shift: $90°$

Period: $\frac{180°}{2} = 90°$

Graph at least one period each function.

$y = -2\cot[2(\theta + 90°)] - 2$

#3) $y = -2\cot(2\theta + 180°) - 2$



A: -2

~~Amplitude:~~

Reflected over midline? Yes

Vertical Displacement: -2

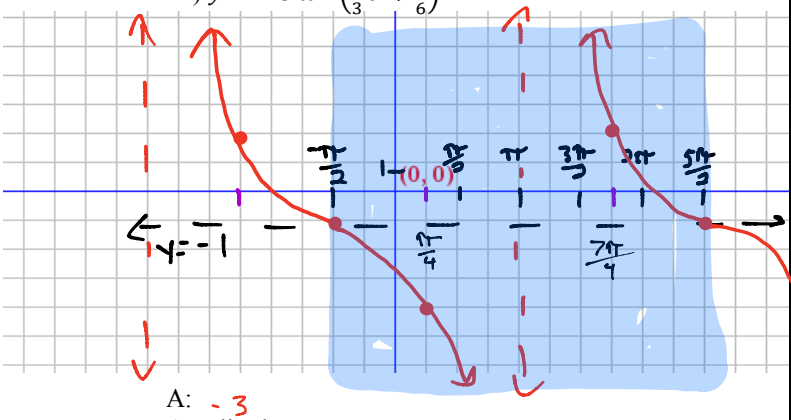
Midline: $y = -2$

Phase Shift: $-90°$

Period: $\frac{180°}{2} = 90°$

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

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



A: -3

~~Amplitude:~~

Reflected over x-axis? Yes

Vertical Displacement: -1

Midline: $y = -1$

Phase Shift: $-\frac{\pi}{2}$

Period: $\frac{\pi}{\frac{1}{3}} = 3\pi$

$y = \cot\left[\frac{1}{3}(\theta + 3\pi)\right]$

#4) $y = \cot\left(\frac{1}{3}\theta + \pi\right)$

A: 1

~~Amplitude:~~

Reflected over midline? NO

Vertical Displacement: 0

Midline: $y = 0$

Phase Shift: -3π

Period: $\frac{\pi}{\frac{1}{3}} = 3\pi$