

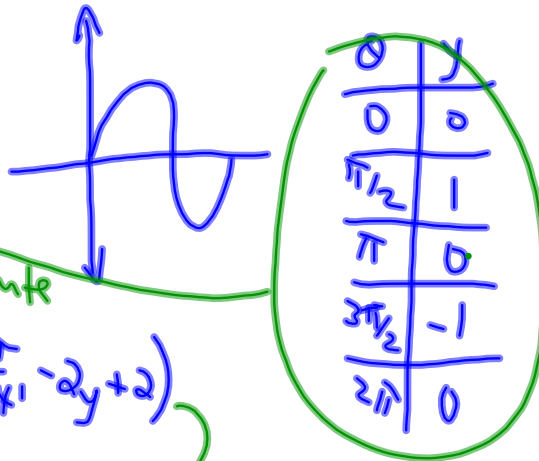
Complete the chart shown below and sketch one full cycle of this function

DOMAIN	$\theta \in \mathbb{R}$
RANGE	$0 \leq y \leq 4$
AMPLITUDE	2
PERIOD	$2\pi/3$
PHASE SHIFT	$\pi/2$ left
VERTICAL TRANSLATION	up 2
EQUATION OF SINUSOIDAL AXIS	$y=2$

$$-\frac{1}{2}(y+2) = \sin\left(3\theta + \frac{\pi}{8}\right) - 2$$

$$y+2 = -2\sin\left(3\left(\theta + \frac{\pi}{24}\right)\right) + 4$$

$$y = -2\sin\left(3\left(\theta + \frac{\pi}{24}\right)\right) + 2$$



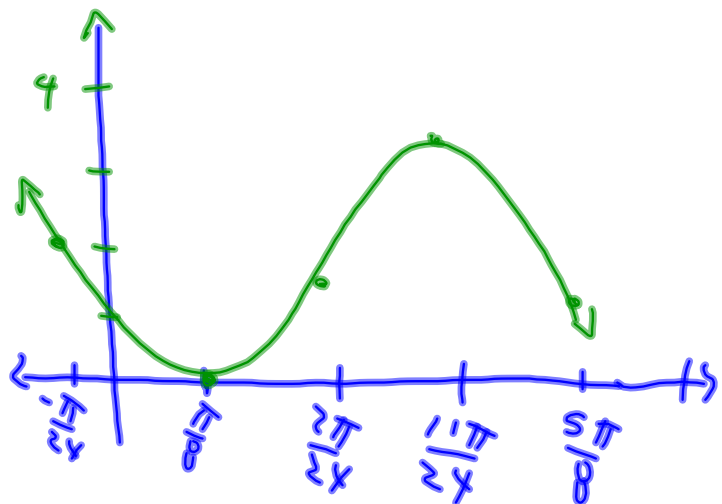
Substitute

$$(x, y) \rightarrow \left(\frac{1}{3}\theta - \frac{\pi}{24}, -2y + 2\right)$$

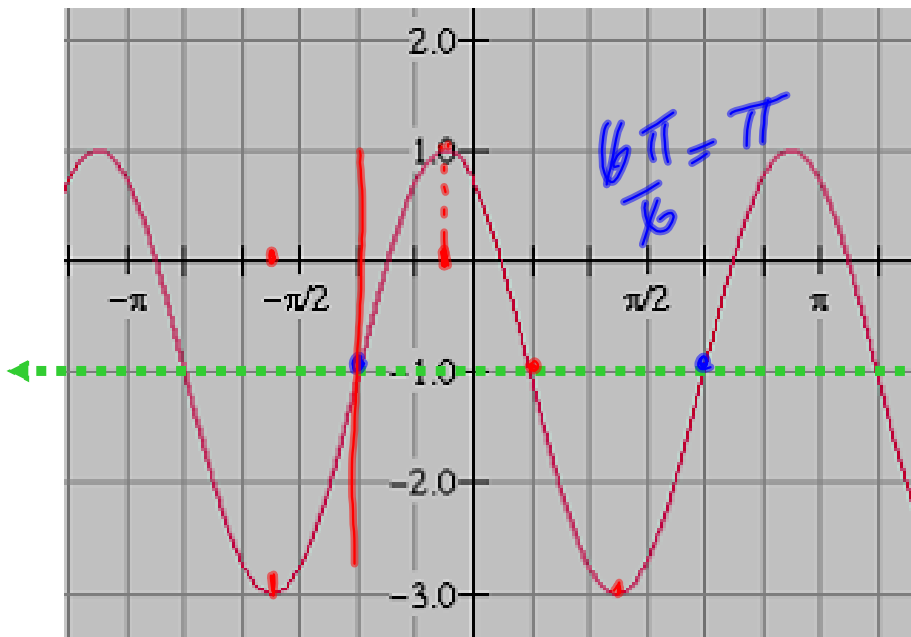
$(\frac{5\pi}{18})$

θ	y
$-\frac{\pi}{24}$	2
$\frac{3\pi}{24}$	0
$\frac{7\pi}{24}$	2
$\frac{11\pi}{24}$	4
$\frac{15\pi}{24}$	2

New Points



Write both a cosine and sine function to describe the graph shown



Ver. shift $\Rightarrow -1$
 Amplitude $\Rightarrow 2$
 Period: π
 $Per = \frac{2\pi}{K}$
 $\pi = \frac{2\pi}{K}$
 $K = \frac{2\pi}{\pi} = 2$

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

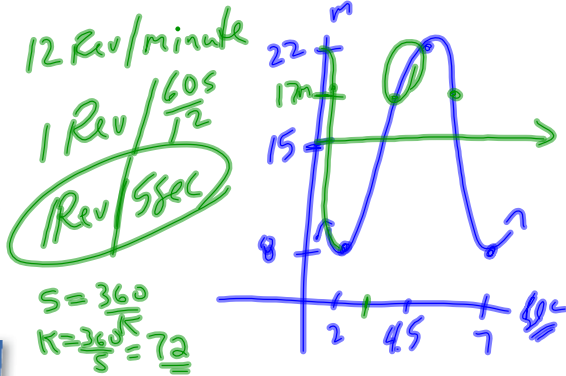
$$y = -2 \sin\left(2\left(\theta - \frac{\pi}{6}\right)\right) - 1$$

$$y = 2 \cos\left(2\left(\theta + \frac{\pi}{2}\right)\right) - 1$$

$$y = -2 \cos\left(2\left(\theta + \frac{\pi}{2}\right)\right) - 1$$

The Canadian National Historic Windpower Centre, at Etzikom, Alberta, has various styles of windmills on display. The tip of the blade of one windmill reaches its minimum height of 8 m above the ground at a time of 2 s. Its maximum height is 22 m above the ground. The tip of the blade rotates 12 times per minute.

- Write a sine or a cosine function to model the rotation of the tip of the blade.
- What is the height of the tip of the blade after 4 s?
- For how long is the tip of the blade above a height of 17 m in the first 10 s?



$$(a) y = -7 \cos(72(t-2)) + 15$$

$$(b) t = 4$$

$$y = -7 \cos[72(4-2)] + 15$$

$$y = \underline{20.7 \text{ m}}$$

$$c) 17 = -7 \cos(72(t-2)) + 15$$

$$2 = -7 \cos(72(t-2))$$

$$\frac{-2}{7} = \cos(72(t-2))$$

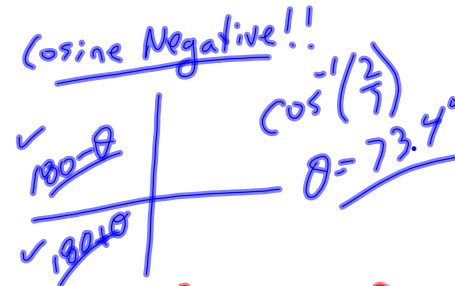
$$\cos^{-1}\left(\frac{-2}{7}\right) = 72(t-2)$$

$$\frac{106.6}{72} = \frac{72(t-2)}{72} + 2$$

$$t = \underline{3.5 \text{ sec}}$$

Interval 1: 0 - 1 sec \leftarrow 1 sec

Interval 2: 6.0 - 3.5
 \leftarrow 2.5 sec



$$Q3 \quad \frac{253.4}{72} = \frac{72(t-2)}{72} + 2$$

$$t = \underline{5.5 \text{ sec}}$$

$$\frac{-5 \text{ sec}}{1 \text{ sec}}$$

$$3.5 + 5 = 8.5 \text{ sec}$$

Interval 3: 8.5 sec \rightarrow 10 s
 \leftarrow 1.5 sec

$$\approx \underline{5.0 \text{ sec}}$$