MA110 - 10/31.

Students moving on to Calc. I should consider Math Excel.

Intro question -
Find period of
$f(t) = \sin(\pi t/12)$.

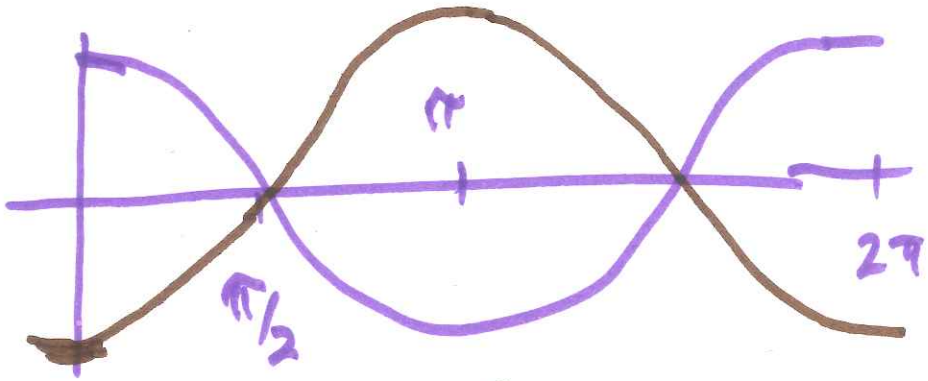
f passes through one period of

$0 \le \frac{\pi t}{12} \le 2\pi$

$0 \le t \le 2\pi \cdot \frac{12}{\pi} = 24$

Graph
$f(x) = -\cos(x+\pi)$.

1. Graph of $\cos(x)$.
2. Shift π units to the left to obtain graph of $\cos(x+\pi)$.
3. Reflect in x-axis to obtain $-\cos(x+\pi)$.

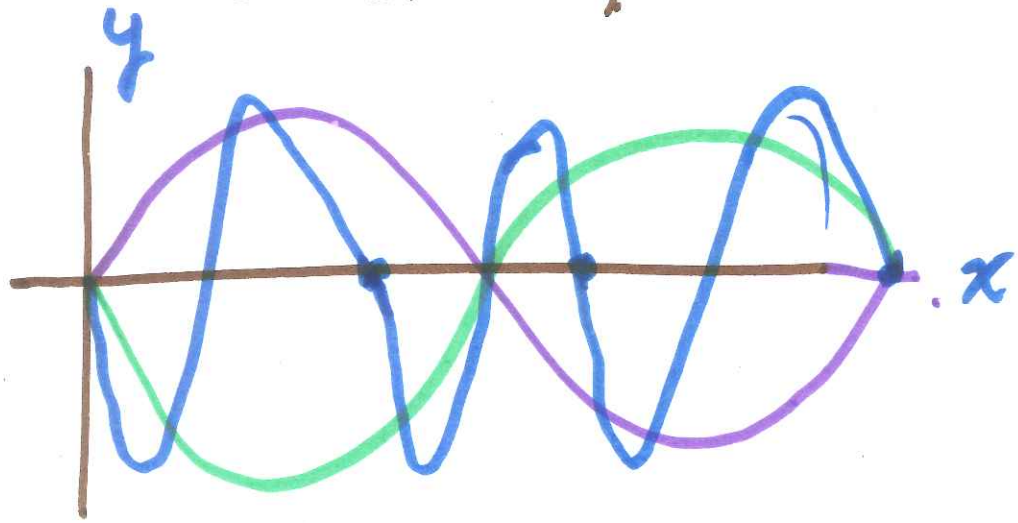


$\cos(x)$ — $\cos(x+\pi)$ —

$-\cos(x+\pi) = \cos(x)$.

This is an identity - an equation true for all x.

Graph $\sin(x)$ and transform to obtain the graph of $\sin(3x + \pi)$



- $\sin(x)$ —
- $\sin(x+\pi)$ —
- $\sin(3x+\pi)$ —

has period $2\pi/3$

A. ~~Sh~~ f

Shift π units left

$g(x) = f(x+\pi)$

Shrink by factor 3

$h(x) = g(3x)$

$= f(3x+\pi)$.

C. $f(x)$

Shrink horiz. by 3

$g(x) = f(3x)$.

Shift left.

$h(x) = g(x+\pi)$

$= f(3(x+\pi))$

$= f(3x+3\pi)$.

In general $f(x+\pi)$ and $f(3x+3\pi)$ will be different

But for $f(x)=\sin(x)$

$\sin(3x+3\pi)$

$= \sin(3x+\pi+2\pi)$

$= \sin(3x+\pi)$.

For functions of the form

$f(x) = a\sin(bx+c)$

or $a\cos(bx+c)$

w/ $b>0$.

$|a|$ is the amplitude

$2\pi/b$ is the period.

$-c/b$ is the phase shift.

If we write

$a\sin(bx+c) = a\sin\left(b\left(x+\frac{c}{b}\right)\right)$

$-c/b$ represents how far to the right we shift the

graph of $a\sin(bx)$
(or shift to left of $-c/b$)

Suppose daily temp. varies between 50° 70° degrees. Write a function of the form

$f(t) = A + B\sin(Ct+D)$

which models this.
Add a sine function of amplitude 10 to 60.

$f(t) = 60 + 10\sin(Ct+D)$.

Assume t is measured in hours.

Want a period of 24 hrs.

$0 \le t \le 24$.

To obtain $0 \le Ct \le 2\pi$

$C \cdot 24 = 2\pi$

$C = 2\pi/24 = \pi/12$.

$f(t) = 60 + 10\sin\left(\frac{\pi}{12}t + D\right)$

If t is hours after midnight we want the low temperature

Back to Game at t=6

Want

$$\frac{\pi \cdot 6}{12} + D = -\frac{\pi}{2}$$

$$D = -\pi.$$

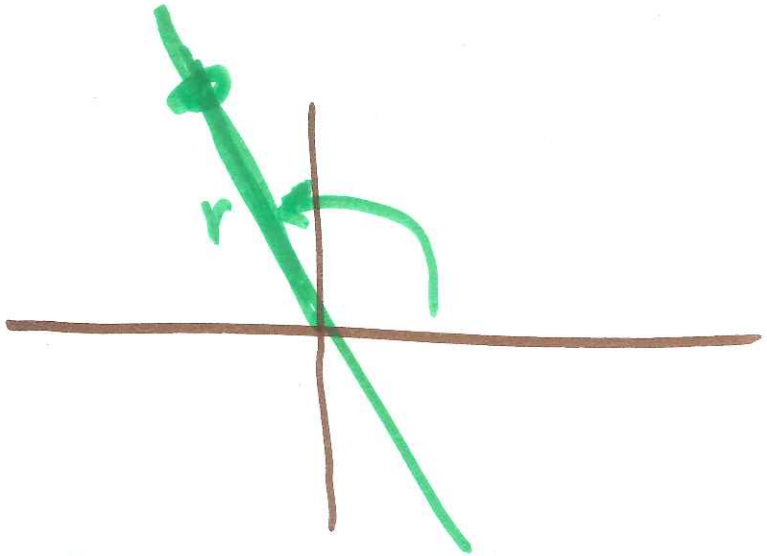
Answer

$$f(t) = 60 + 10\sin\left(\frac{\pi t}{12} - \pi\right)$$

Review

Terminal side of angle t lies on the line $y = -2x$. $x < 0$. Find

$\sec(t)$, $\sin(t)$, $\tan(t)$



Pick $x = -1$, $y = -2(-1) = +2$.

$r = \sqrt{2^2 + 1^2} = \sqrt{5}$

$$\cos(\theta) = \frac{x}{r}$$

$$= -\frac{1}{\sqrt{5}} = \frac{-\sqrt{5}}{5}$$

$$\sin(\theta) = \frac{y}{r}$$

$$= \frac{2}{\sqrt{5}} = \frac{2\sqrt{5}}{5}.$$

$$\tan(\theta) = \frac{y}{x} = \frac{-2}{1}$$