There is a video recording of Warm Up 1

Properties of Acoustic Plane Waves

$\xi(x, t) = \sin\left[(2\pi)\,880)\,t - \frac{(2\pi)x}{0.391}\right]$

play sound

$\xi(x, 0.00039)$

$\lambda = 39.1$ cm

A5
880 Hz

$c = \frac{\lambda}{T}$

$c = 344. \frac{meters}{second}$

$T = 1.14$ ms

$t = 0.39$ milliseconds

WOLFRM

Sine Waves for Musical Scales

interval length 0.05 0.0272419 0.0544839

key number (from the left) 6

$$y = \sin(230.644\,t)$$

frequency $= 36.7081$ Hz   note $=$ D

1 s   8000 Hz

Frequency (in Hz)

pick a sine function   simple sine curve   sine of sine   beat function   vibrato   square wave

2 s   8000 Hz
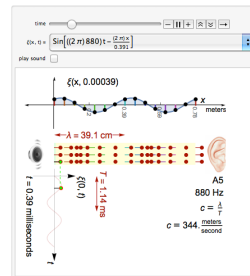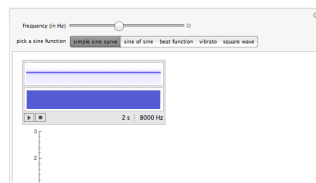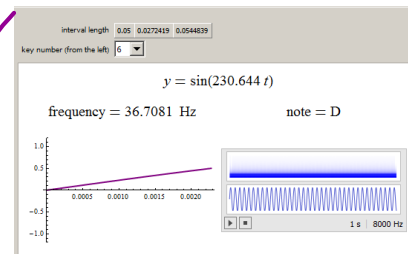
JACK PERIODICALLY EXHIBITED
SINES OF MADNESS

Pick Up the Warm Up

Sketch and label w/o a GDC   in radians
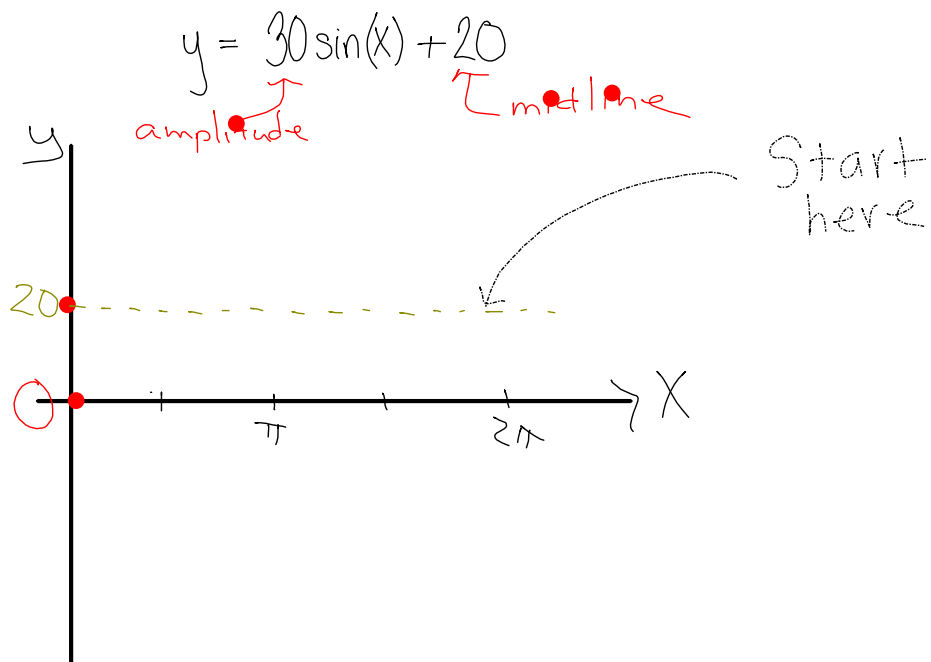
$$y = 30\sin(x) + 20$$

amplitude   midline

20

O

π   2π   X

Start here

Sketch and label w/o a GDC   in radians

$$y = 30\sin(x) + 20$$

↑
amplitude

50

start
with midline → 20

−10

$\frac{\pi}{2}$ π $\frac{3\pi}{2}$ 2π

---

② $y = \cos(x) - 2$
↑
amplitude = 1

0   π 2π

−2

⑊ $y = -20\sin(x) + 10$

10

π 2π
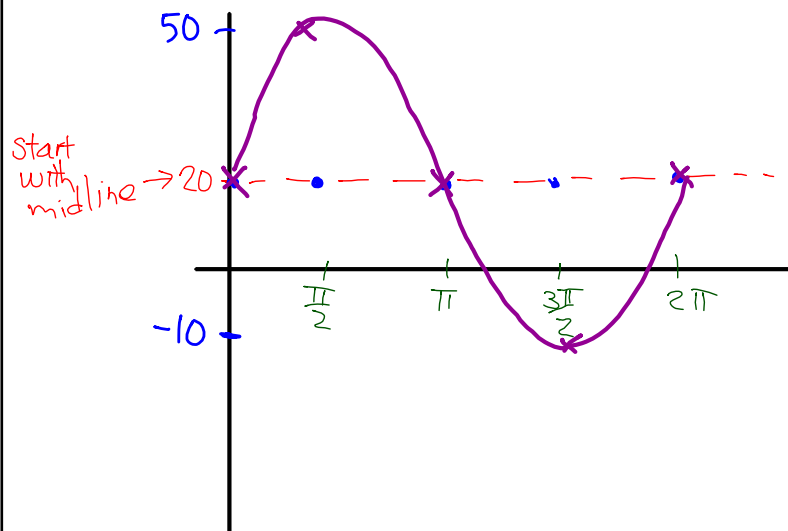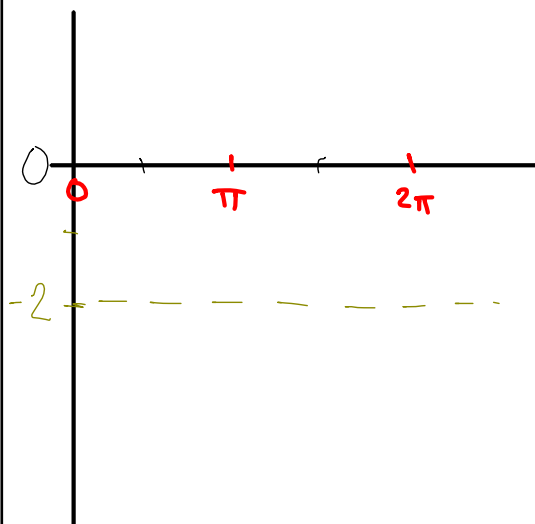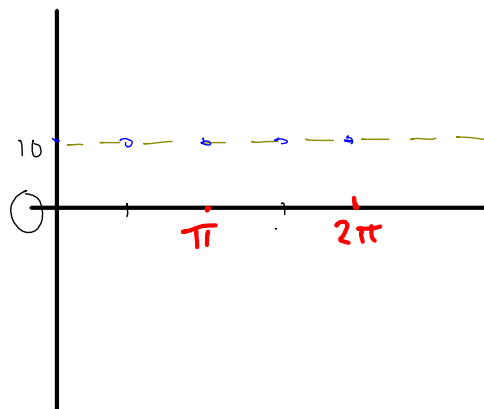
Determine the equation

a)

$$y = 3\sin(\theta)$$

b)

(270°, 1)

(90°, −3)
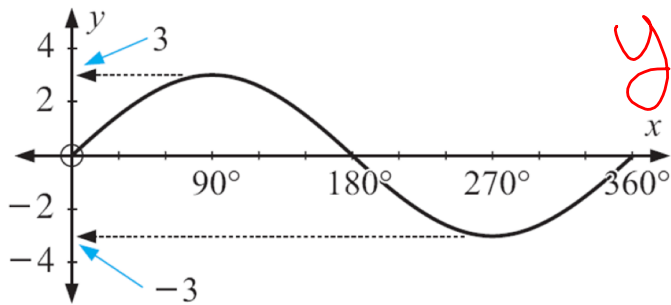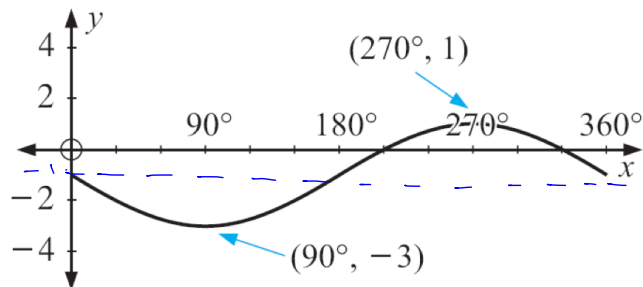
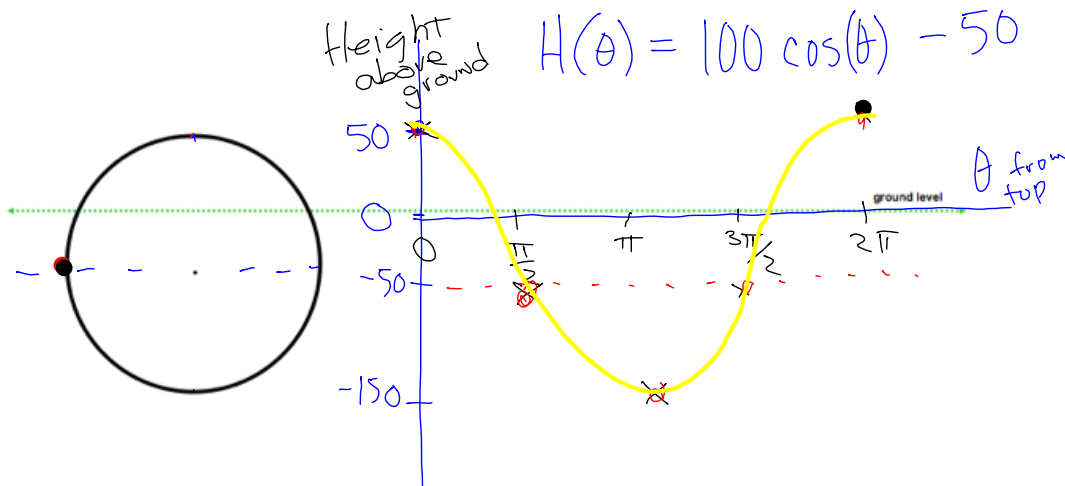$f(x)$

$$y = -2\sin(\theta) - 1$$
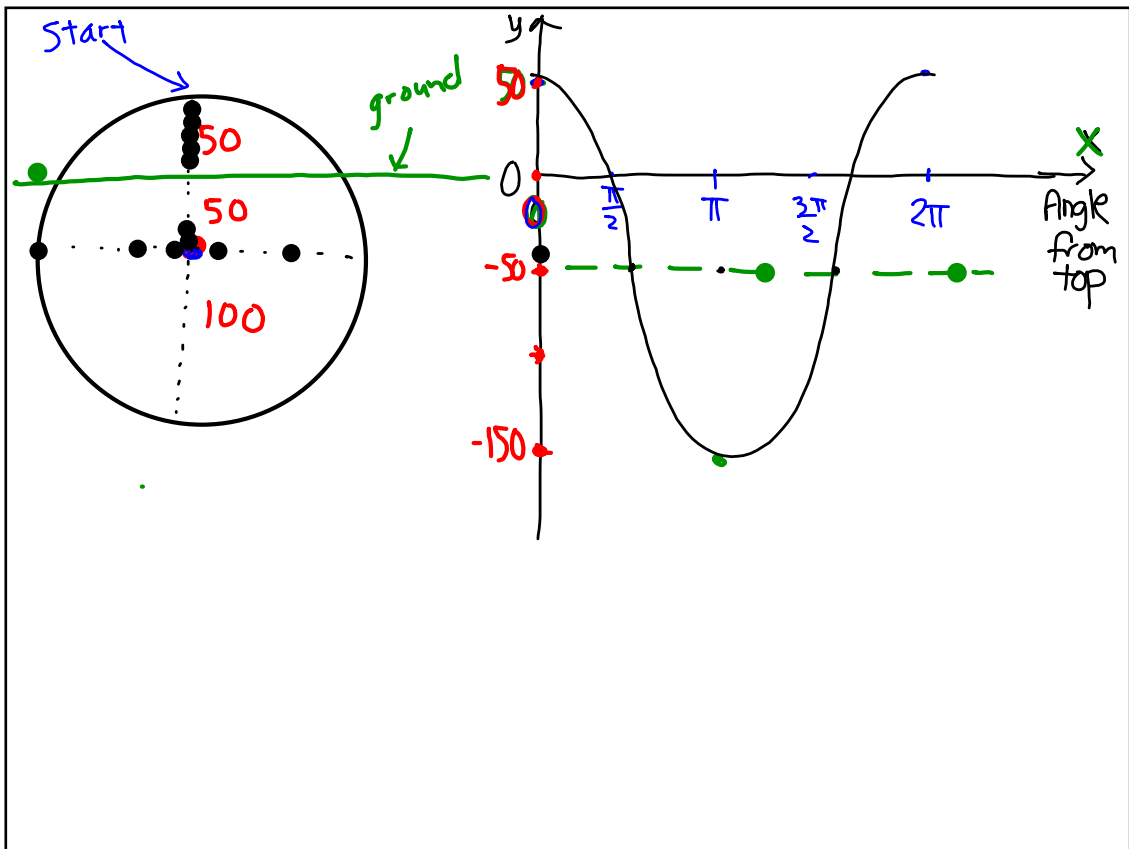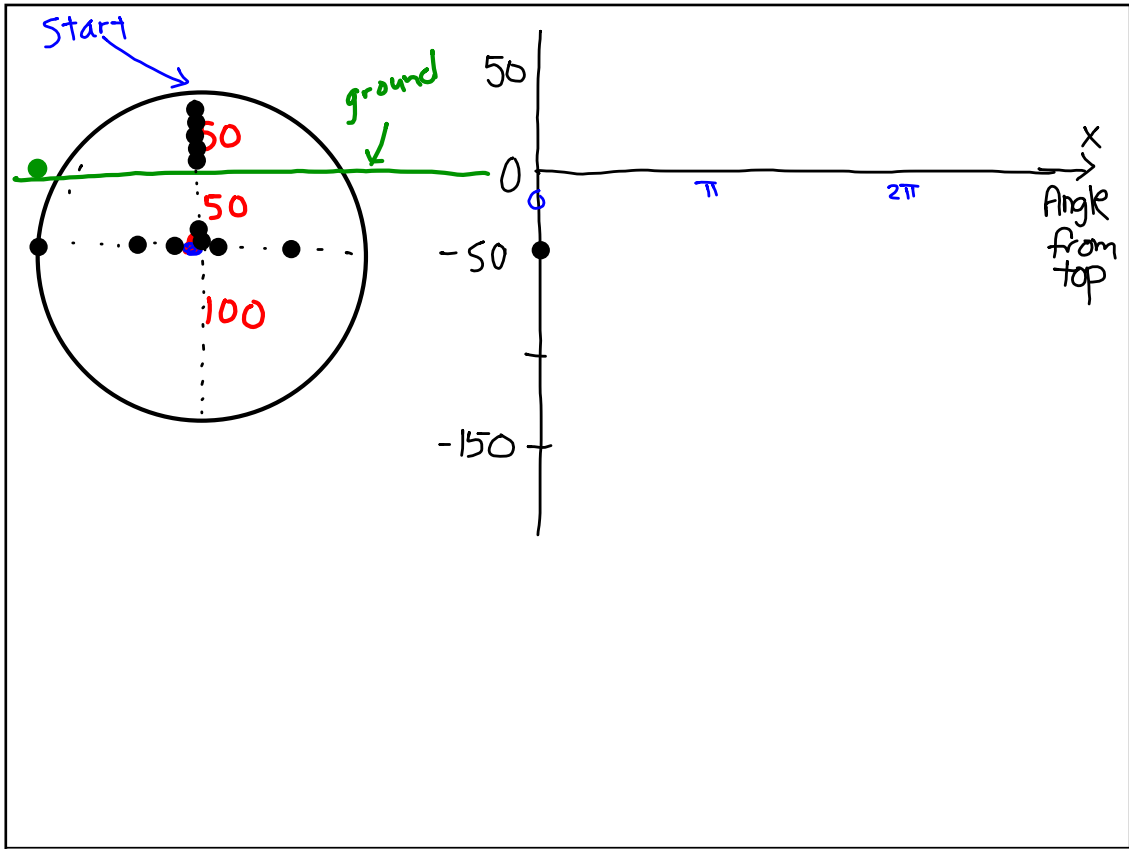
Amusement Park
100' radius
center 50' below ground
Passengers start at highest point

FUNCTION / Angle starting from top •

The CPM Amusement Park has decided to imitate *The Screamer* but wants to make it even better. Their ride will consist of a circular track with a radius of 100 feet, and the center of the circle will be 50 feet under ground. Passengers will board at the highest point, so they will begin with a blood-curdling drop. Write a function that relates the angle traveled *from the starting point* to the height of the rider above or below the ground.
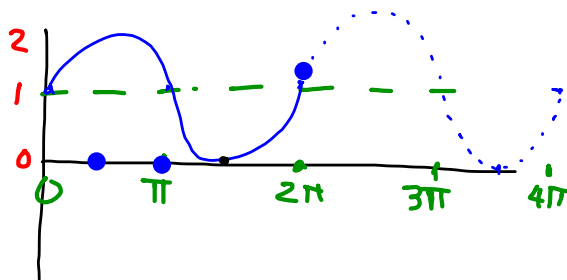
Height above ground

$$H(\theta) = 100 \cos(\theta) - 50$$

θ from top

Start

ground

50

50

50

50

0

0

-50

-150

100

x

Angle from top

π

2π

Start

ground

y

50

50

50

0

0

-50

-150

100

π/2

π

3π/2

2π

x

Angle from top
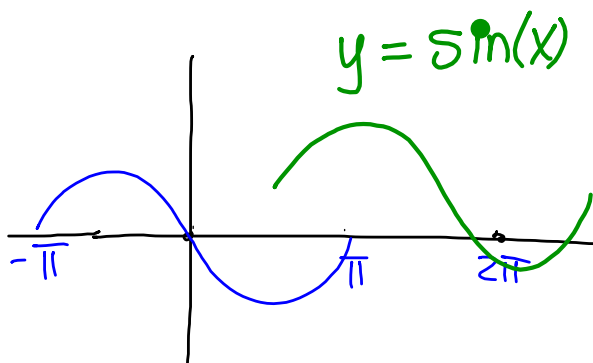
HW Questions

116

(a) $y = \sin(x)$ shifted up 1 UNIT

(b) $y = \sin(x) + 1$

(c) $\left(\frac{3\pi}{2}, 0\right), \left(\frac{7\pi}{2}, 0\right), \ldots \quad \left(\frac{3\pi}{2} + 2\pi n, 0\right)$
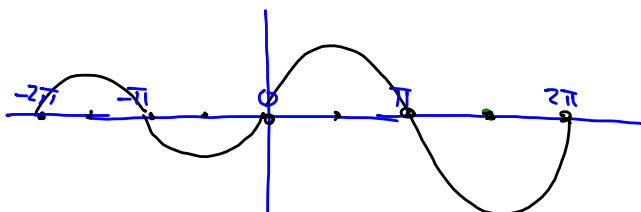
Graph with axis labels 0, 1, 2 on y-axis and 0, π, 2π, 3π, 4π on x-axis.

117

$$y = \sin(x)$$

118

ⓐ Graduating class size ?

ⓑ hunger throughout day ?

ⓒ Tidal heights ?

120    $y = \cos x$ $y = \sin x$

122   a. $\dfrac{3}{x} + \dfrac{2}{x+1} = 5$

$\dfrac{3}{x} + \dfrac{2}{x+1} = 5$

b. $x^2 + 6x + 9 = 2x^2 + 3x + 5$

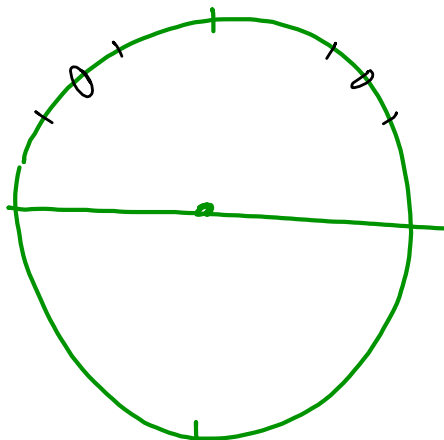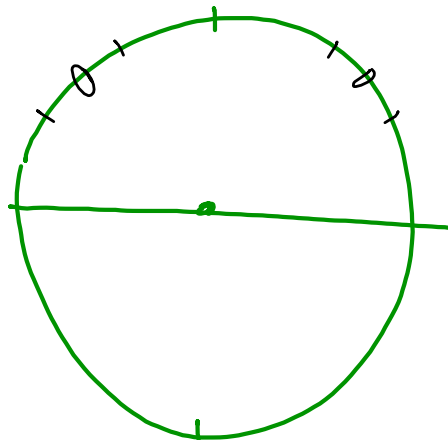 $0 = x^2 - 3x - 4$

---

c. $8 - \sqrt{9 - 2x} = x + 3$
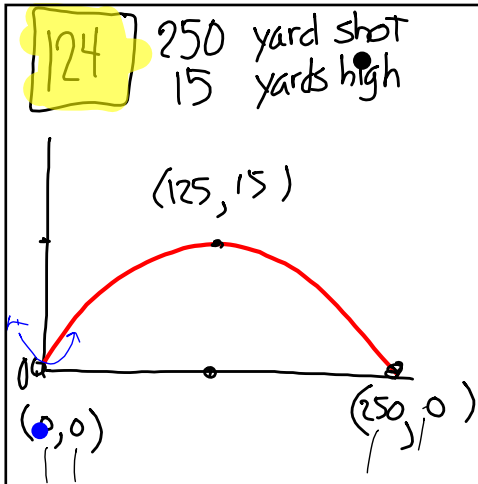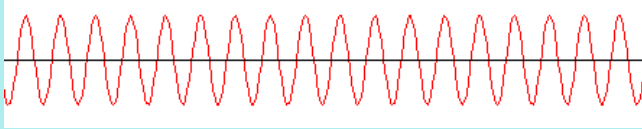
123   a. $\tan\left(\dfrac{2\pi}{3}\right)$

=

b. $\tan\left(\dfrac{7}{6}\pi\right)$

124

250 yard shot
15 yards high

(125, 15)

(0, 0)

(250, 0)

$$y = x^2$$

$$y = a(x-h)^2 + k$$

$$y = a(x-125)^2 + 15$$

$$0 = a(0-12)^2 + 15$$

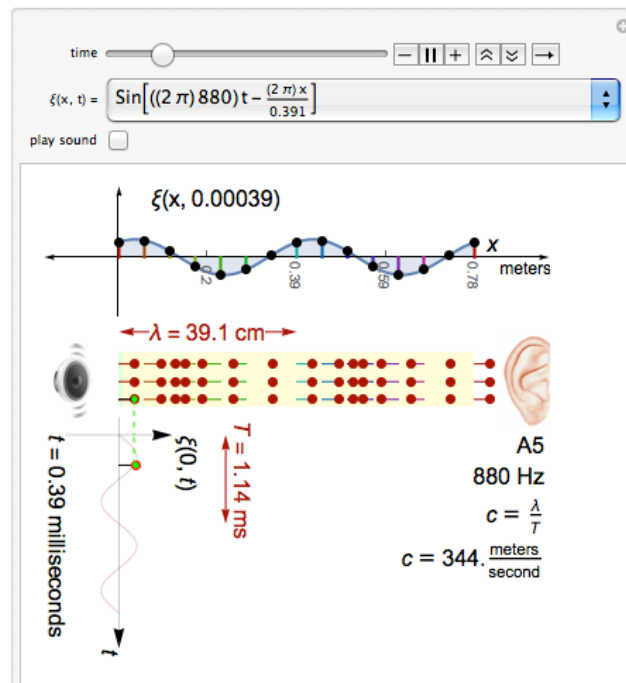A pure tone, produced by a tuning fork, travels in a sine wave

$$y = \sin x$$

The pitch of the tone is related to the *period*.

The intensity is related to the *amplitude*.

Properties of Acoustic Plane Waves

time

$$\xi(x, t) = \sin\left[((2\pi)\,880)\,t - \frac{(2\pi)\,x}{0.391}\right]$$

play sound

$\xi(x, 0.00039)$

x meters

$\lambda = 39.1$ cm

$t = 0.39$ milliseconds

$\xi(0, t)$

$T = 1.14$ ms

A5

880 Hz

$$c = \frac{\lambda}{T}$$

$$c = 344.\frac{meters}{second}$$

Moral of the Story

Cyclic functions can have many different
cycle lenghts (periods)

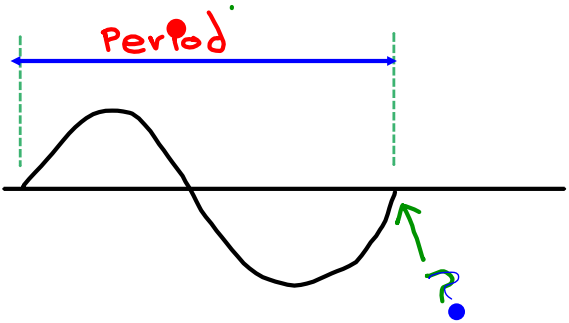<u>A•im</u>

Determine the missing parameter, b,
in the general form

$$y = a \sin(x - h) + k$$

$$\text{or} \quad y = a \cos(x - h) + k$$

Given a
Situation

Period

7-126
read together

2π ~~(crossed out)~~

360 ~~(crossed out)~~

7-126. THE RADAR SCREEN

Brianna is an air traffic controller. Every day she watches the radar line (like a radius of a circle) go around her screen time after time. On one particularly slow travel day, Brianna noticed that it takes 2 seconds for the radar line to travel through an angle of $\frac{\pi}{6}$ radians. She decided to make a graph in which the *input* is time and the *output* is the distance from the outward end of the radar line to the horizontal axis.
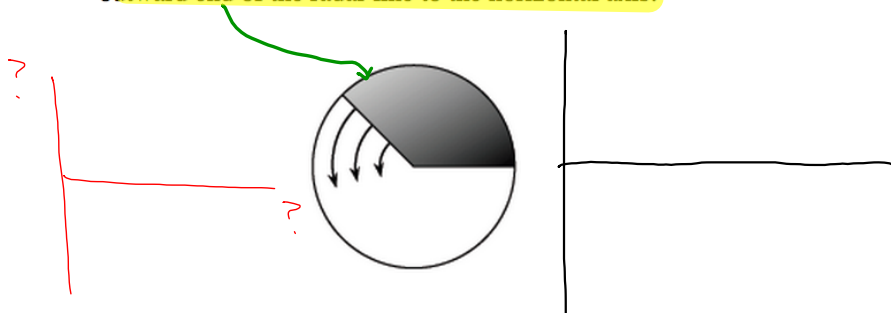
Your Task: Following the input and output specifications above, make a table and graph for Brianna's radar.

Discussion Points

How can we calculate the outputs?

How is this graph different from other similar graphs we have made?

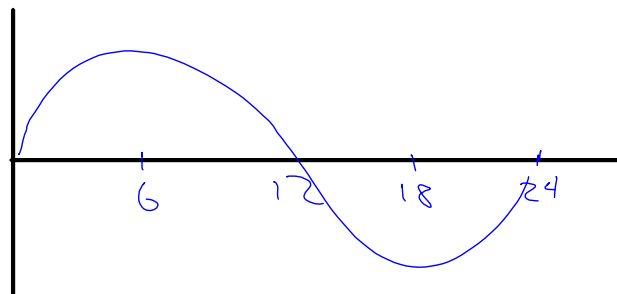How long does it take to complete one full cycle on the radar screen?
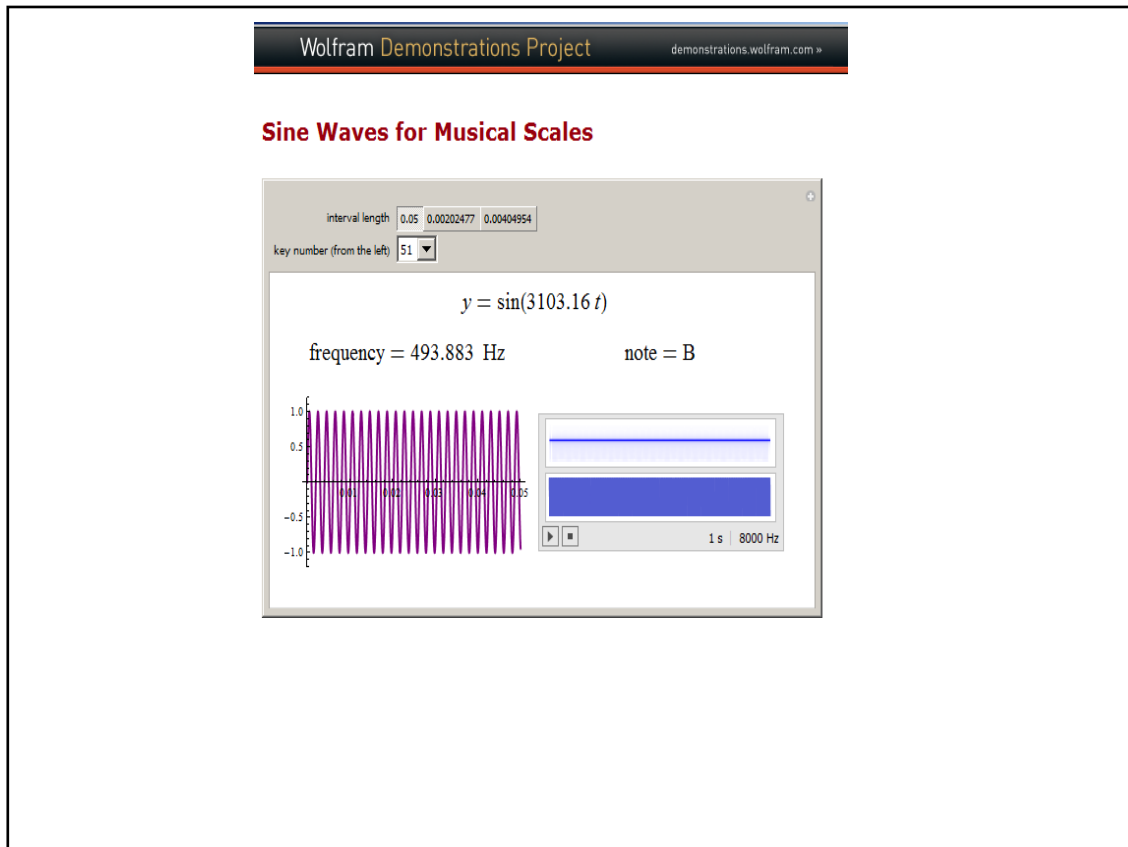How can we see that on the graph?

Table and Graph

↖ can be a neatly made sketch

60 cyles

distance above or below horizontal axis

6   12   18   24

time (sec)

Wolfram Demonstrations Project   demonstrations.wolfram.com »

Sine Waves for Musical Scales

interval length 0.05 0.00202477 0.00404954

key number (from the left) 51

$$y = \sin(3103.16\,t)$$

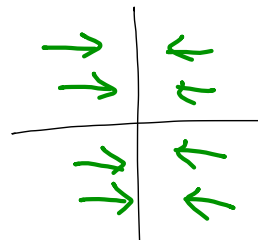frequency $= 493.883$ Hz   note $= B$

1 s   8000 Hz

GDC

$y_1 = \sin(2x)$

$y_2 = \sin(x)$
dark

would __shrink__ all
toward the y-axis
by a factor of $\frac{1}{2}$

x-values

$y_1 = \sin(0.5x)$ $\left(\frac{1}{2}x\right)$

$y_2 = \sin(x)$

$y_1 = \cos\left(\frac{2}{3}x\right)$

$y_2 = \sin(x)$

$\boxed{b}$

y

horiz. stretch by 2

$-\frac{1}{2}$

NOTES

the missing parameter

$$y = a\sin[b(x-h)] + k$$

horiz. stretch or shrink factor

if there is no horizontal slide

$$y = a\sin(bx) + k$$

B.B.

B.B.

Pick up the 5 graphs

$y = 2\cos(\theta)$

①

$y = \cos(2x)$

$\cos(\frac{1}{2}x)$

$y = \cos(5x)$

②

③

$y = 3\sin(x)$

$y = 3\sin(2x)$

④

$y = 3\sin(3x)$

⑤
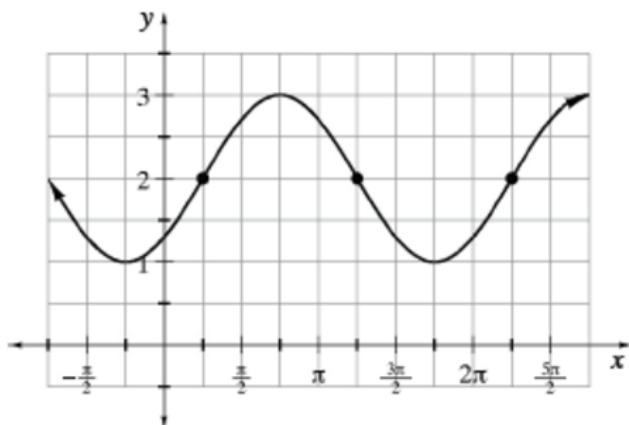

$y = \sin(2x) - 2$
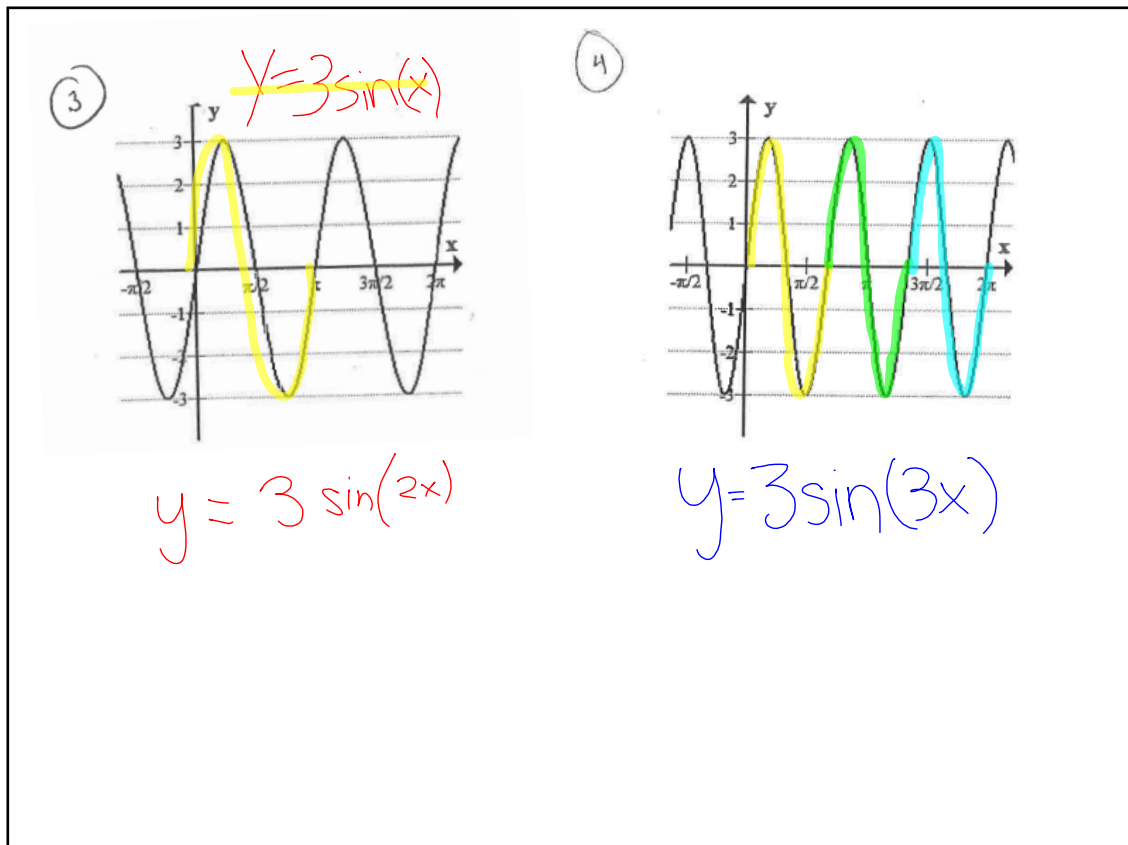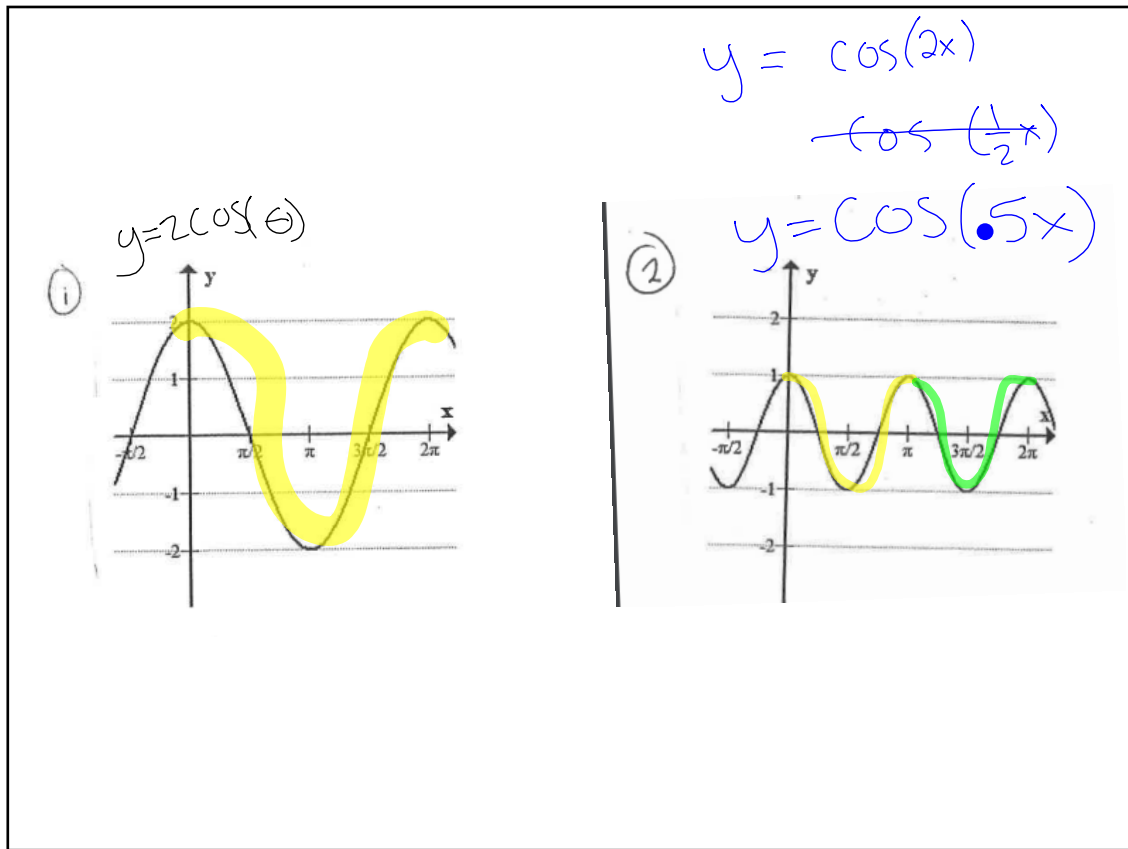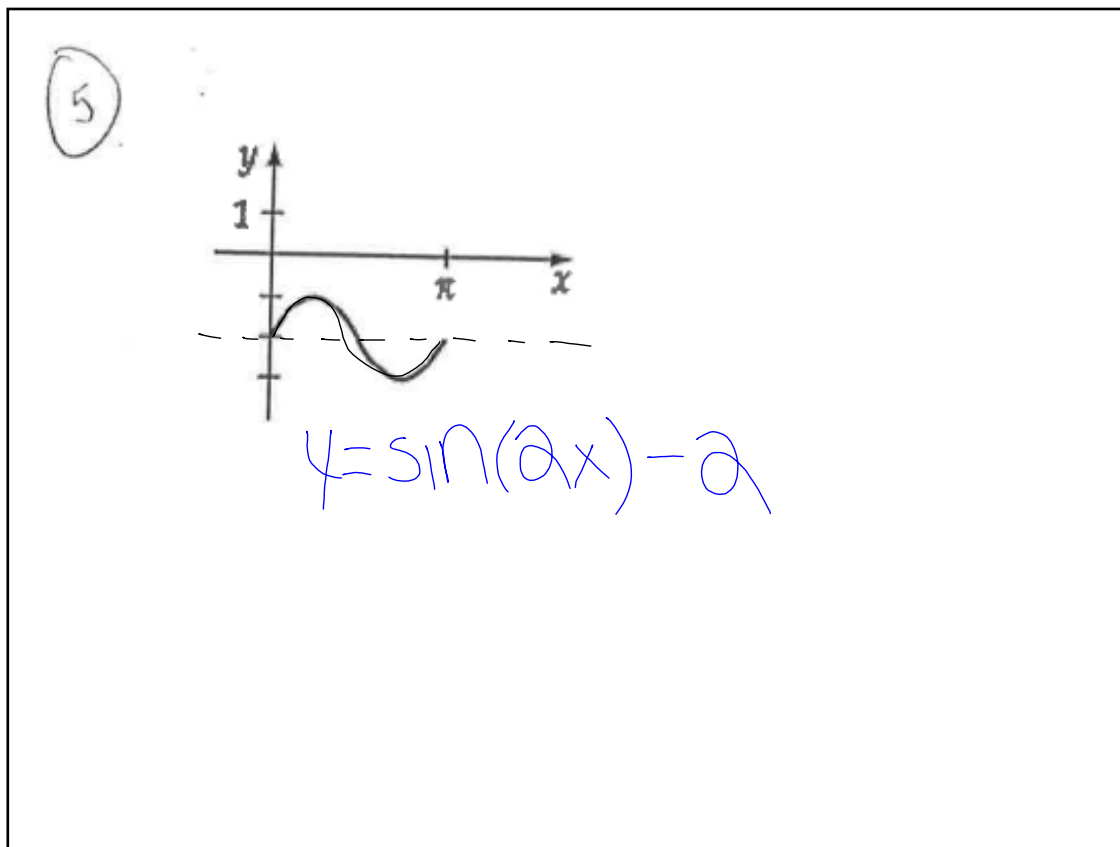
Assignment

7...

Worksheet 7.2.2
which will include a few textbook problems
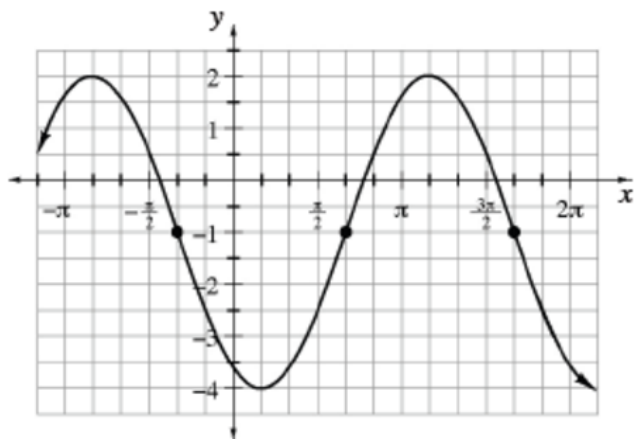
skip part A. a to f

start with g

pdf

a.

b.

c.

d.

4-7 HW Questions