

Key

Graphing Trig Functions Day 3- Phase Shift!

$Y = a \sin(b(x - h)) + k$ h is the phase shift! Just as in other functions, this shifts the graph horizontally h units!

A. $y = \sin(x - \pi/3)$



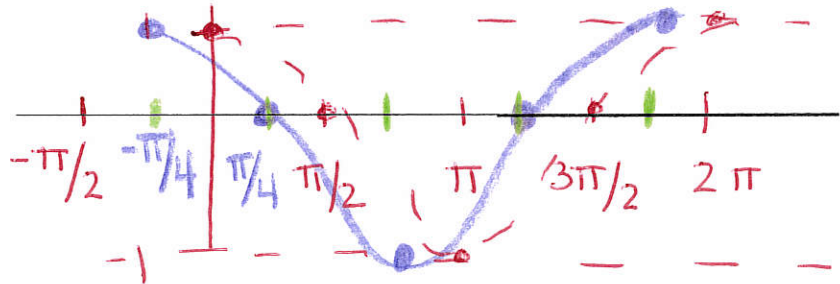
$C = \pi/3$

P.S $\pi/3$ RT \rightarrow create $\pi/12$ $\pi/3 =$

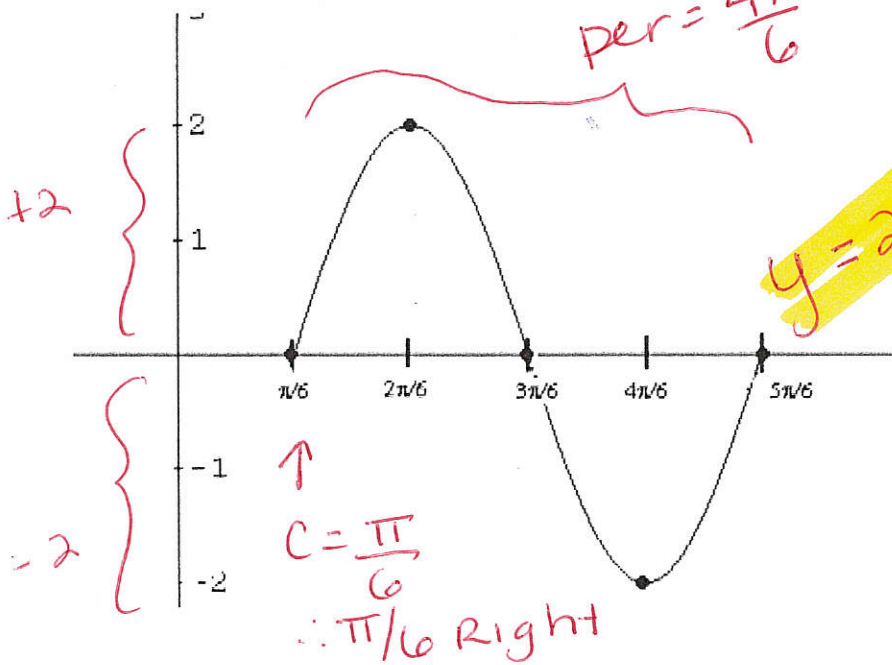
B. $y = \cos(x + \pi/4)$

$C = -\pi/4$

PS = $\pi/4$ left



C. Find the equation of the graph

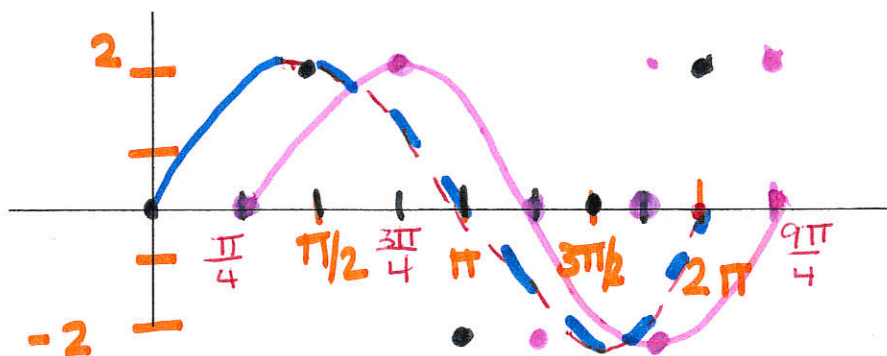


$y = 2 \sin[3(x - \pi/6)]$ $a = 0$

$a = 2$
 pos sin
 $C = \pi/6$
 $\pi/6$ RIGHT \rightarrow
 $(x - \pi/6)$
 PERIOD = $\frac{4\pi}{6}$
 $\frac{2\pi}{b} = \frac{4\pi}{6}$
 $4\pi b = 12\pi$

$b = 3$

D. $y = 2 \sin\left(x - \frac{\pi}{4}\right)$



k = midline = 0

a = 2 So

max line = 2

min line = -2

b = 1 so period = 2π

increment = π/2

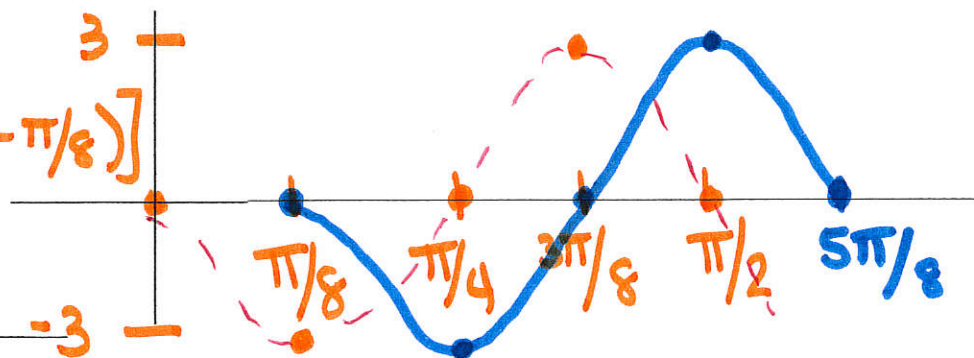
p.s. π/4 Right

Do you need to adjust increment?

E. $y = -3 \sin\left(4x - \frac{\pi}{2}\right)$

$y = -3 \sin\left[4\left(x - \frac{\pi}{8}\right)\right]$

*** Is it in factored form?
Rewrite - factor out "b"



k = midline = 0

a = -3 So

max line = 3

min line = -3

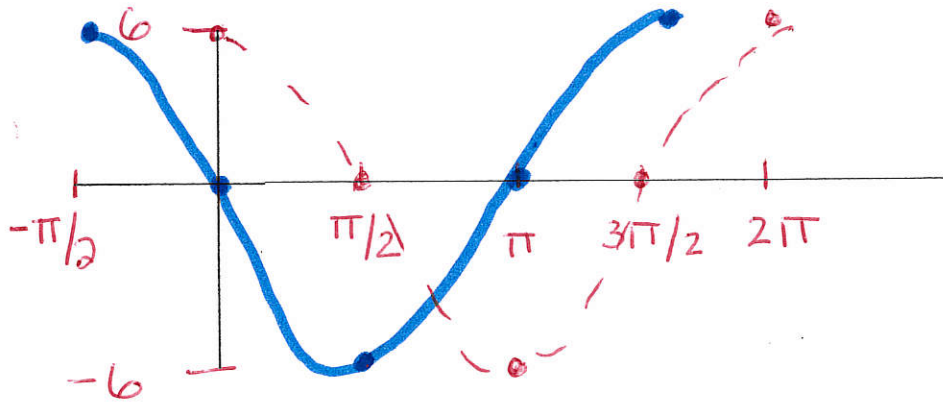
b = 4 so period = π/2

increment = π/8

p.s. π/8 Right

Do you need to adjust increment?

$$F. y = 6 \cos(x + \frac{\pi}{2})$$



$$k = \text{midline} = \underline{0}$$

$$a = \underline{6} \text{ So}$$

$$\text{max line} = \underline{6}$$

$$\text{min line} = \underline{-6}$$

Where does graph "start"? max

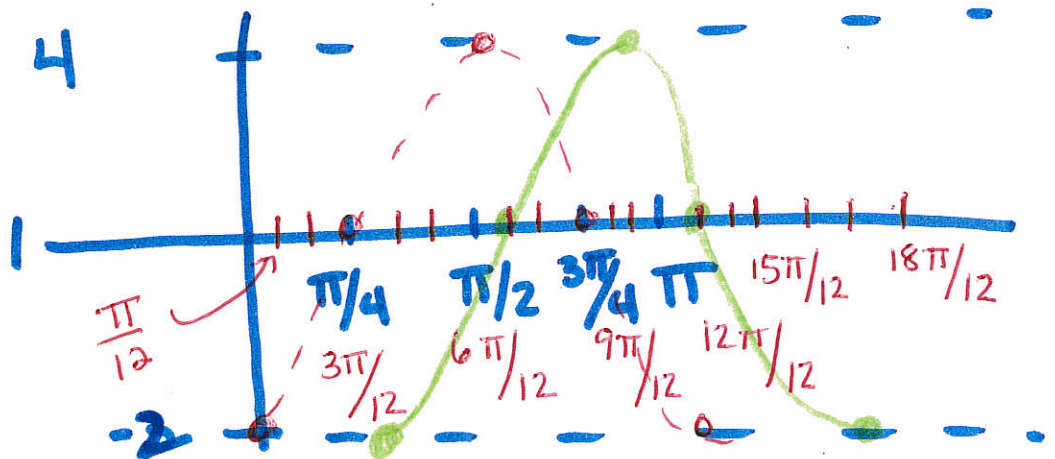
$$b = \underline{1} \text{ so period} = \underline{2\pi}$$

$$\text{increment} = \underline{\pi/2}$$

$$\text{p.s.} \underline{\pi/2 \text{ left}}$$

Do you need to adjust increment?

$$G. y = -3 \cos 2(x - \frac{\pi}{3}) + 1$$



$$k = \text{midline} = \underline{1}$$

$$a = \underline{3} \text{ So}$$

$$\text{max line} = \underline{4}$$

$$\text{min line} = \underline{-2}$$

Where does graph "start"? min

$$b = \underline{2} \text{ so period} = \underline{\pi}$$

$$\text{increment} = \underline{\pi/4} = \underline{3\pi/12}$$

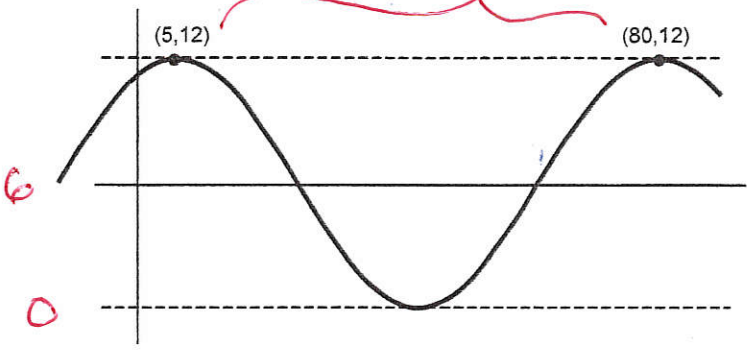
$$\text{p.s.} \underline{\pi/3} = \underline{4\pi/12}$$

Do you need to adjust increment?

iceberg

Write the equations of the graphs below: Use these questions to help you! Use paper!

H.



period = $80 - 5 = 75$

Sine or cosine? pos

$K = +6$

$a = 6$

$h = 5$ right

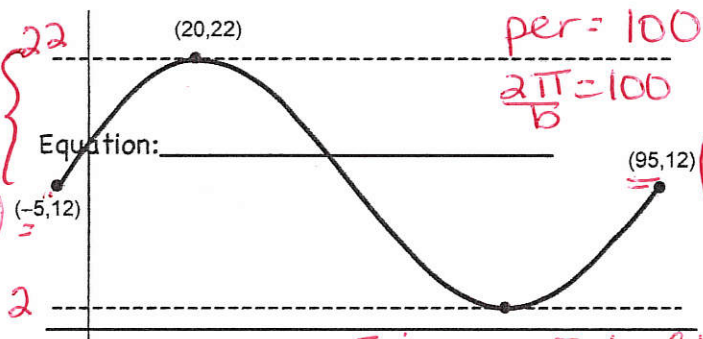
period = 75 so

$b = \frac{75 = \frac{2\pi}{b}}{b} = 75b = 2\pi$
 $b = \frac{2\pi}{75}$

EQ: _____

$y = 6 \cos \left[\frac{2\pi}{75} (x - 5) \right] + 6$

I.



per = 100

$\frac{2\pi}{b} = 100$

$100b = 2\pi$

$b = \frac{\pi}{50}$

Equation: _____

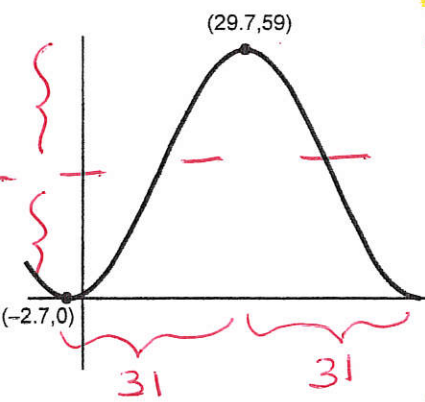
EQ: _____

I: SINE: p.s. = 5 left

$y = 10 \sin \left[\frac{\pi}{50} (x + 5) \right] + 12$

$a = 10$
 $d = 12$

J.



$d = 29.5$

$a = -29.5 \cos$

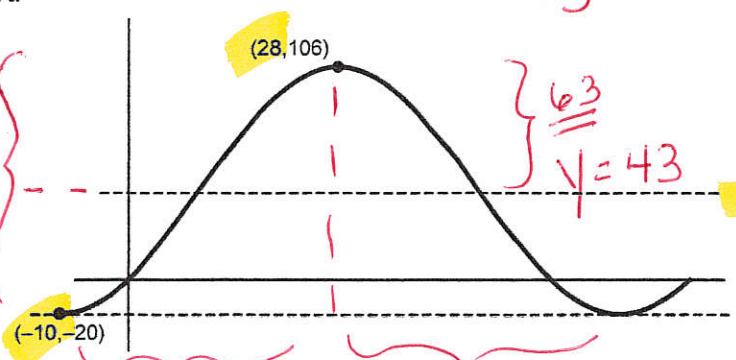
cos p.s. 2.7 left

$y = -29.5 \cos \left[\frac{29.5}{31} (x + 2.7) \right] + 29.5$

if use COS
P.S. = 20 RT.

$y = 10 \cos \left[\frac{\pi}{50} (x - 20) \right] + 12$

K.



$a = -63$
 $d = 43$

Neg COS: $a = -63$

$d = 43$

$y = -63 \cos \left[\frac{\pi}{38} (x + 10) \right] + 43$

$a = -10$

p.s. = 10 left

$(x + 10)$

$\therefore \text{per} = 38 = \frac{2\pi}{b}$ $23ab = 2\pi$ $b = \frac{\pi}{38}$

$a = 63$

10.2 Practice – Phase Shift and Tangent

Name: Solutions

Pre-Calculus

For 1-3, identify the amplitude, period, phase shift and vertical shift of each function.

1. $f(x) = 13 \sin\left(4\left(x + \frac{\pi}{11}\right)\right) - 7$

Amp: 13 Period: $\frac{2\pi}{4} = \frac{\pi}{2}$

Phase Shift: left $\frac{\pi}{11}$

Vertical Shift: down 7

2. $f(\theta) = -25 \cos(7(\theta - 10)) + 3$

Amp: 25 Period: $\frac{2\pi}{7}$

Phase Shift: right 10

Vertical Shift: up 3

3. $f(\theta) = 4 - 9 \sin\left(2\left(\theta + \frac{2\pi}{7}\right)\right)$

Amp: 9 Period: $\frac{2\pi}{2} = \pi$

Phase Shift: left $\frac{2\pi}{7}$

Vertical Shift: up 4

4. $f(\theta) = -3 \cos\left(2\theta + \frac{\pi}{8}\right) - 10$

Amp: 3 Period: $\frac{2\pi}{2} = \pi$

Phase Shift: left $\frac{\pi}{8}$

Vertical Shift: down 10

5. $f(\theta) = 2 \sin\left(\frac{\theta}{2} - \frac{\pi}{5}\right) - 5$

Amp: 2 Period: $\frac{2\pi}{\frac{1}{2}} = 4\pi$

Phase Shift: right $\frac{2\pi}{5}$

Vertical Shift: down 5

6. $f(x) = 6 \cos\left(3x + \frac{\pi}{6}\right) + 11$

Amp: 6 Period: $\frac{2\pi}{3}$

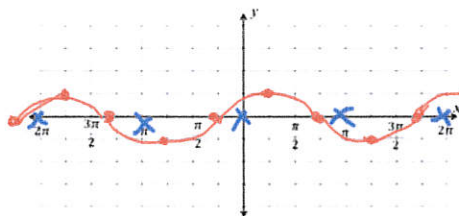
Phase Shift: left $\frac{\pi}{6}$

Vertical Shift: up 11

For 7-18, graph the trig function.

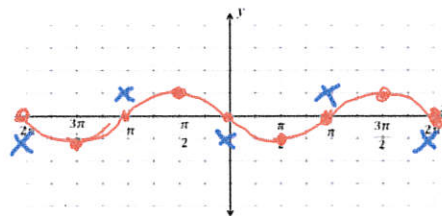
7. $y = \sin\left(x + \frac{\pi}{4}\right)$

Amp 1 Period 2π P.S. left $\frac{\pi}{4}$ V.S. none



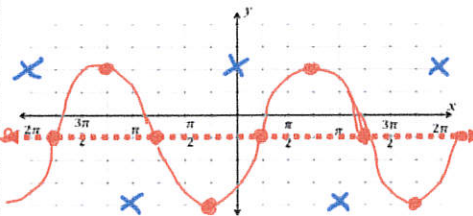
8. $y = -\cos\left(x - \frac{\pi}{2}\right)$

Amp 1 Period 2π P.S. right $\frac{\pi}{2}$ V.S. none



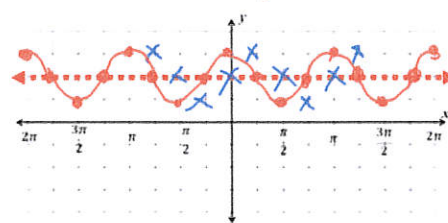
9. $y = 3 \cos\left(x - \frac{3\pi}{4}\right) - 1$

Amp 3 Period 2π P.S. right $\frac{3\pi}{4}$ V.S. down 1



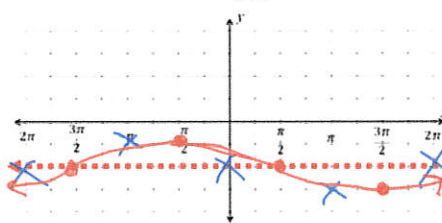
10. $y = 2 + \sin\left(2\left(x + \frac{\pi}{4}\right)\right)$

Amp 1 Period π P.S. left $\frac{\pi}{4}$ V.S. up 2



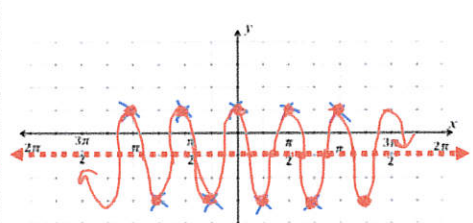
11. $y = -\sin\left(\frac{1}{2}\left(x - \frac{\pi}{2}\right)\right) - 2$

Amp 1 Period 4π P.S. right $\frac{\pi}{2}$ V.S. down 2



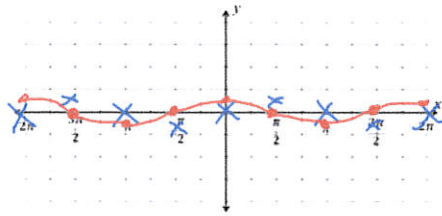
12. $y = 2 \cos(4(x - \pi)) - 1$

Amp 2 Period $\frac{\pi}{2}$ P.S. right π V.S. down 1



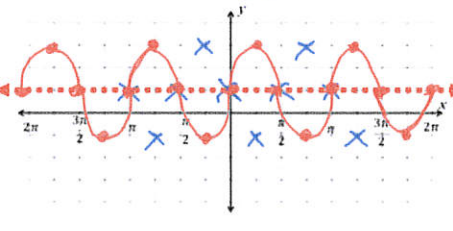
13. $y = \frac{1}{2} \sin(x - \frac{3\pi}{2})$

Amp $\frac{1}{2}$ Period 2π P.S. right $\frac{3\pi}{2}$ V.S. none



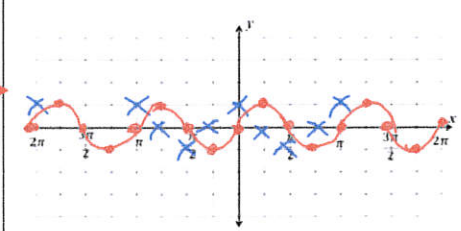
14. $y = -2 \sin(2x + \pi) + 1$

Amp 2 Period π P.S. left $\frac{\pi}{2}$ V.S. up 1



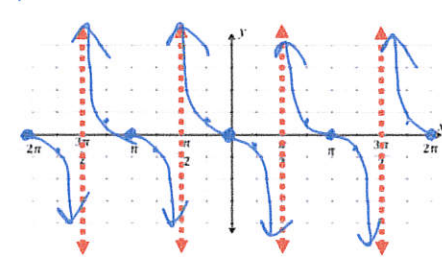
15. $y = \cos(2x - \frac{\pi}{2})$

Amp 1 Period π P.S. right $\frac{\pi}{4}$ V.S. none



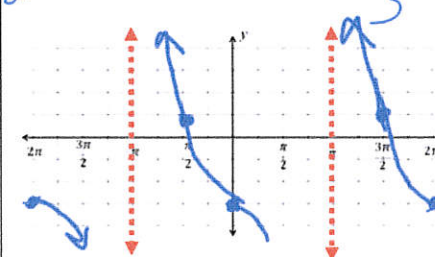
16. $y = -\frac{1}{2} \tan x$

Period $\frac{\pi}{1} = \pi$ P.S. none V.S. none



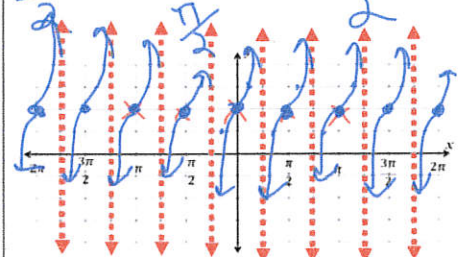
17. $y = 4 \tan(-\frac{1}{2}x) - 3$

Period $\frac{\pi}{1/2} = 2\pi$ P.S. none V.S. down 3



18. $y = \tan(2x - \pi) + 2$

Period $\frac{\pi}{2}$ P.S. right $\frac{\pi}{2}$ V.S. up 2



For 19 – 21, use the given information to create a sine function.

19. Amplitude: 2 $\frac{3\pi}{2} = \frac{3\pi}{6}$
 Period: $\frac{3\pi}{2}$ $3\pi b = 4\pi$
 Phase Shift: left $\frac{5\pi}{9}$ $b = \frac{4}{3}$
 Vertical Shift: down 14
 $y = 2 \sin(\frac{4}{3}(\theta + \frac{5\pi}{9})) - 14$
 $y = 2 \sin(\frac{4}{3}\theta + \frac{20\pi}{27}) - 14$

20. Amplitude: 5 $\frac{2\pi}{6} = \frac{\pi}{6}$
 Period: $\frac{\pi}{6}$ $12\pi = 6\pi$
 Phase Shift: right $\frac{\pi}{24}$ $12 = b$
 Vertical Shift: up 8
 $y = 5 \sin(12(\theta - \frac{\pi}{24})) + 8$
 $y = 5 \sin(12\theta - \frac{\pi}{2}) + 8$

21. Amplitude: 1 $\frac{2\pi}{6} = 6$
 Period: 6 $2\pi = 6b$
 Phase Shift: left $\frac{6\pi}{7}$ $\frac{\pi}{3} = b$
 Vertical Shift: up 2
 $y = \sin(\frac{\pi}{3}(\theta + \frac{6\pi}{7})) + 2$
 $y = \sin(\frac{\pi}{3}\theta + \frac{2\pi}{7}) + 2$

For 22-24, write the equation of the following sine curves. Use a positive leading coefficient a and the closest phase shift possible (left or right). For some problems, it may be equal to move left or right.

22. down 1 left or right $\frac{\pi}{2}$ $\frac{2\pi}{6} = \pi$
 $2 = b$
 $y = 2 \sin(2(\theta - \frac{\pi}{2})) - 1$
 $y = 2 \sin(2\theta - \pi) - 1$

23. left π $\frac{2\pi}{6} = \frac{4\pi}{6}$
 $\frac{1}{2} = b$
 $y = 3 \sin(\frac{1}{2}(\theta + \pi))$
 $y = 3 \sin(\frac{1}{2}\theta + \frac{\pi}{2})$

24. up 1 right π $\frac{2\pi}{6} = 6\pi$
 $\frac{1}{3} = b$
 $y = \sin(\frac{1}{3}(\theta - \pi)) + 1$
 $y = \sin(\frac{1}{3}\theta - \frac{\pi}{3}) + 1$

