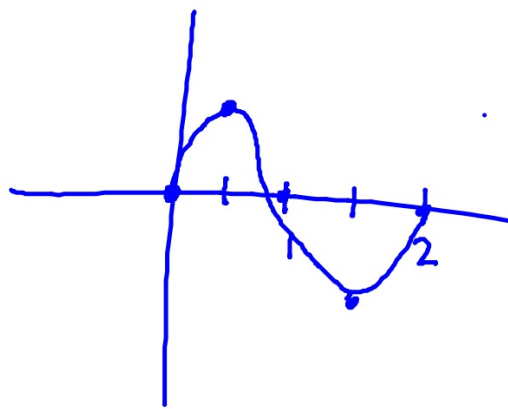9. $y = \sin \pi x$

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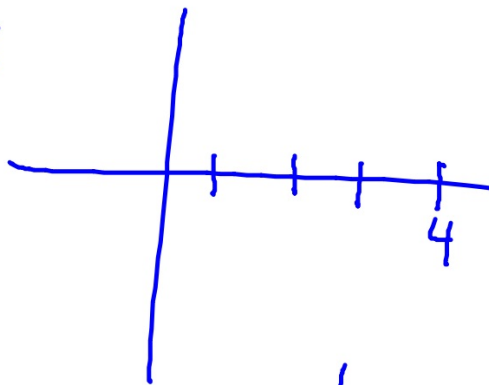incr. $\frac{2}{4} = \frac{1}{2}$

11. $y = \sin \frac{\pi}{2}x$
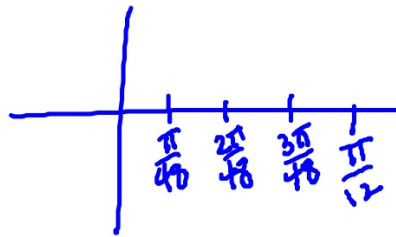
amp: 1

period $\frac{2\pi}{\frac{\pi}{2}} = 4$



4

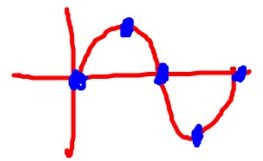13.) $y = \cos 24x$

$a = 1$

per: $\frac{2\pi}{24} = \frac{\pi}{12}$



$\frac{\pi}{48}$  $\frac{2\pi}{48}$  $\frac{3\pi}{48}$  $\frac{\pi}{12}$
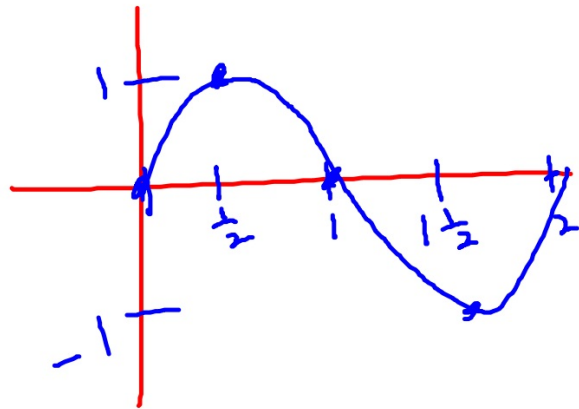
# 10.2 Transformations of sinx and cosx

9.) $y = \sin \pi x$

period: $\dfrac{2\pi}{\pi}$

$\dfrac{2}{}$

incr: $\dfrac{1}{2}$

Transformations

$$y = 3\sin 2x - 1$$

$y = a\sin b(x - c) + d$   or   $y = a\cos b(x - c) + d$

a: Amplitude  $|a|$

b: This value determines the period of the function

period =  2pi/b

c: phase shift (aka horizontal translation)
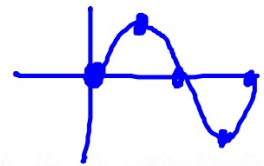
d: vertical shift

y = asinb(x + c) + d

$(bx + c)$

Horizontal translation
Phase shift (PS)

$bx - c = 0$

$b(x + c) = 0$

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

$$2x - \pi = 0$$
$$x = \frac{\pi}{2}$$
right $\frac{\pi}{2}$

$$y = 3\sin 2(x + 8)$$
$$2(x + 8) = 0$$
$$x = -8$$
8 left

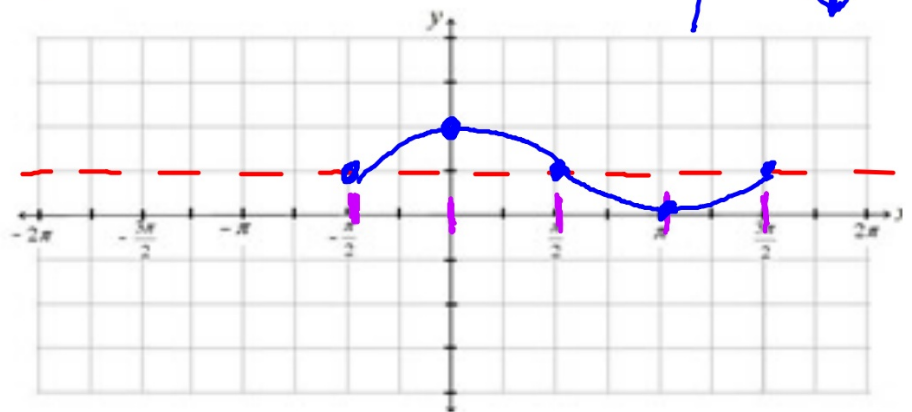#1  $y = \sin\left(x + \frac{\pi}{2}\right) + 1$

Amplitude  1

period  $2\pi$

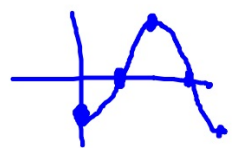Increments  $\frac{\pi}{2}$

vertical shift  up 1

phase shift  $x + \frac{\pi}{2} = 0$

left $\frac{\pi}{2}$   $x = -\pi/2$

Domain  $(-\infty, \infty)$
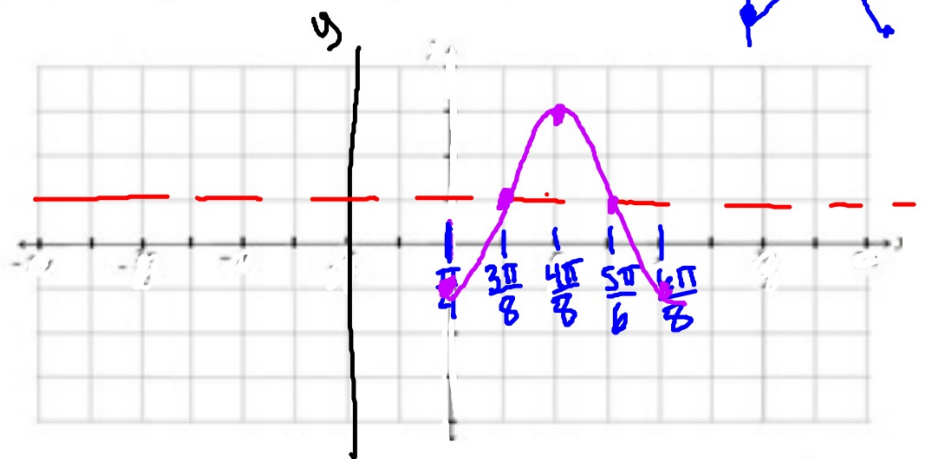Range   $[0, 2]$

#2 $y = -2\cos(4x - \pi) + 1$

Amplitude $2$

period $\dfrac{2\pi}{b} = \dfrac{\pi}{2}$

Increments $\dfrac{\pi}{8}$
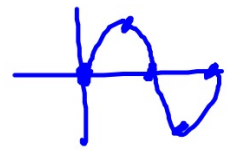
vertical shift UP $1$

phase shift right $\dfrac{\pi}{4}$

Domain $(-\infty, \infty)$

Range $[-1, 3]$
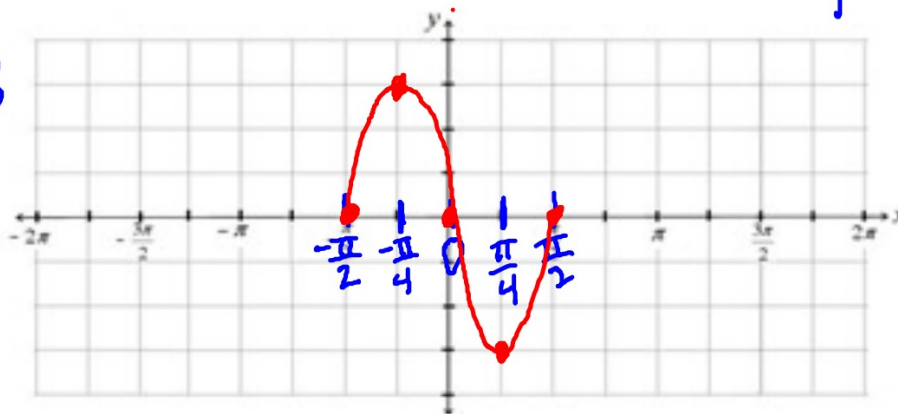
#3    $y = 3\sin(2x + \pi)$

Amplitude **3**

period $\pi$

Increments $\pi/4$

vertical shift n/a

phase shift left $\dfrac{\pi}{2}$

$-\dfrac{\pi}{2} + \dfrac{\pi}{4}$

$-\dfrac{\pi}{4}$

Domain $\{x \mid x \in \mathbb{R}\}$

Range $\{y \mid -3 \le y \le 3\}$