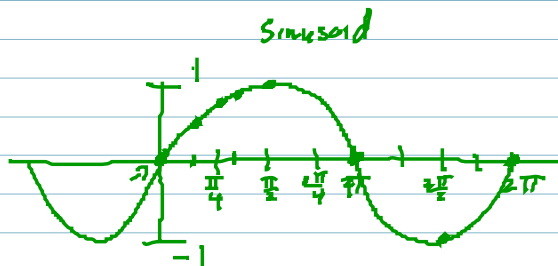


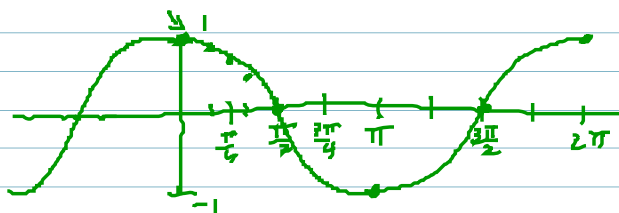
X	\downarrow $\sin(x)$
0	0
$\pi/6$	$\frac{1}{2}$
$\pi/4$	$\frac{\sqrt{2}}{2} \approx 0.707$
$\pi/3$	$\frac{\sqrt{3}}{2} \approx 0.86$
$\pi/2$	1
π	0
$\frac{3\pi}{2}$	-1
2π	0



$$D = (-\infty, \infty)$$

$$R = [-1, 1]$$

X	\downarrow $\cos(x)$
0	1
$\pi/6$	$\frac{\sqrt{3}}{2}$
$\pi/4$	$\frac{\sqrt{2}}{2}$
$\pi/3$	$\frac{1}{2}$
$\pi/2$	0
π	-1
$\frac{3\pi}{2}$	0
2π	1



Transformations - $f(x) = a \sin(b(x-c)) + d$

Amplitude - $|a|$ - vertical stretch compress
 $= \frac{\max - \min}{2}$

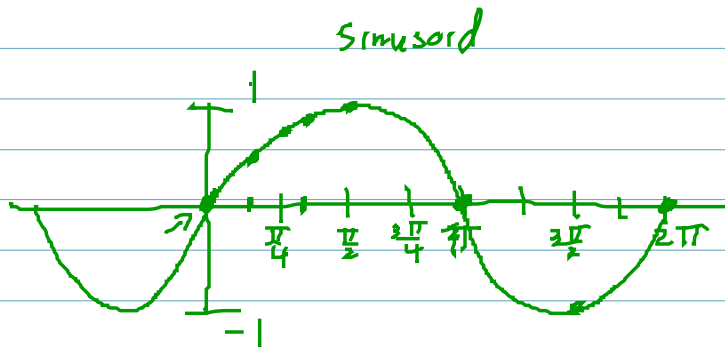
Period $\rightarrow T = \frac{2\pi}{b}$ $b = \frac{2\pi}{T}$

vertical shift - d up - $d > 0$ $d = \frac{\max + \min}{2}$
 Down - $d < 0$

Phase shift - c Right - $c > 0$
 Left - $c < 0$

Reflection - sign of a

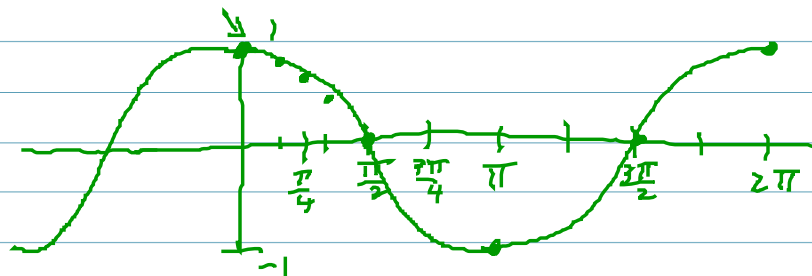
X	$\sin(x)$
0	0
$\pi/6$	$\frac{1}{2}$
$\pi/4$	$\frac{\sqrt{2}}{2} \approx 0,707$
$\pi/3$	$\frac{\sqrt{3}}{2} \approx 0,866$
$\pi/2$	1
π	0
$+\frac{3\pi}{2}$	-1
2π	0



$$D = (-\infty, \infty)$$

$$R = [-1, 1]$$

X	$\cos(x)$
0	1
$\pi/6$	$\frac{\sqrt{3}}{2}$
$\pi/4$	$\frac{\sqrt{2}}{2}$
$\pi/3$	$\frac{1}{2}$
$\pi/2$	0
π	-1
2π	0
2π	1



w ω, h k
 \downarrow \downarrow \downarrow

Transformations - $f(x) = a \sin(b(x-c)) + d$

Amplitude - $|a|$ - vertical stretch compress
 $= \frac{\max - \min}{2}$

Period $\Rightarrow T = \frac{2\pi}{b}$

$b \approx \frac{2\pi}{T}$

vertical shift - d

up - $d > 0$

Down - $d < 0$

$$d = \frac{\max + \min}{2}$$

Phase shift - c

Right - $c > 0$

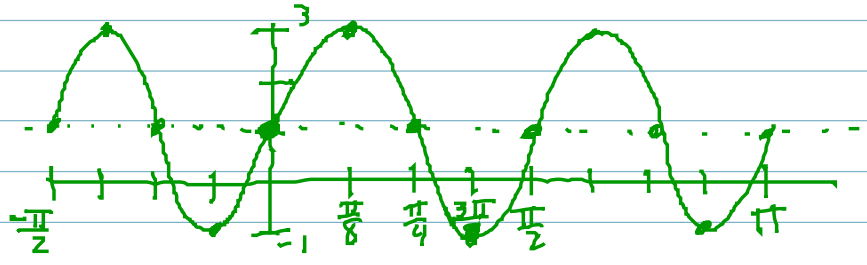
Left - $c < 0$

Reflection - sign of a

Bad good

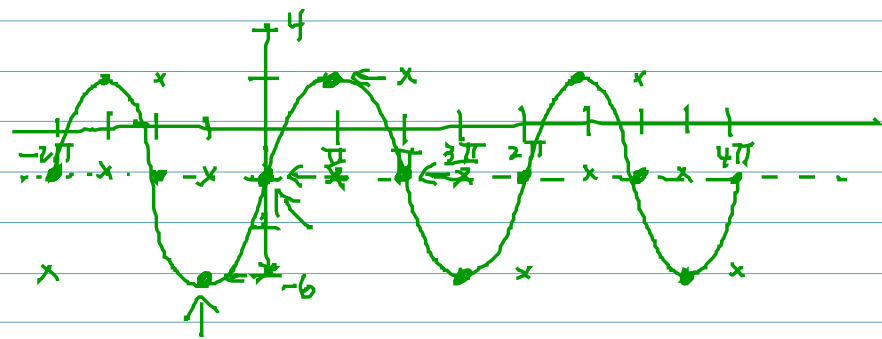
$$f(x) = 2 \sin(4x) + 1$$

$A = 2$
 $T = \frac{2\pi}{4} = \frac{\pi}{2}$
 $VS = \uparrow$
 $PS = \text{None}$
 $R = \text{None}$



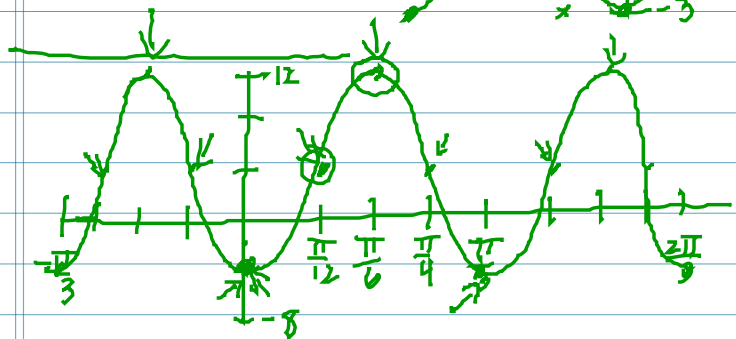
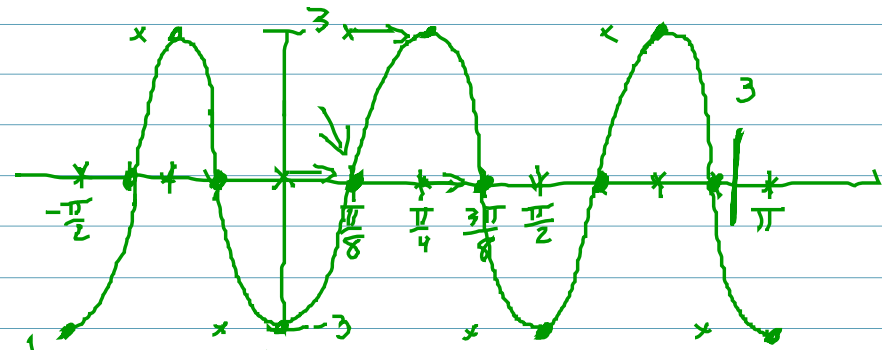
$$f(x) = -4 \cos(x + \frac{\pi}{2}) - 2$$

$A = 4$
 $T = 2\pi$
 $VS = \downarrow 2$
 $PS = \leftarrow \frac{\pi}{2}$
 $R = \checkmark$



$$f(x) = 3 \sin(4x - \frac{\pi}{2}) = 3 \sin(4(x - \frac{\pi}{8}))$$

$A = 3$
 $T = \frac{2\pi}{4} = \frac{\pi}{2}$
 $VS = \text{NONE}$
 $PS = \rightarrow \frac{\pi}{8}$
 $R = \text{NONE}$



$A = \frac{12 - (-8)}{2} = \frac{20}{2} = 10$
 $T = \frac{\pi}{3}$
 $VS = \frac{12 + (-8)}{2} = \frac{4}{2} = 2$
 $PS = \leftarrow \frac{\pi}{6}$
 $R = \checkmark$

$$f(x) = 8 \sin(6(x - \frac{\pi}{6})) + 4$$

$$= -8 \sin(6(x + \frac{\pi}{12})) + 4$$

$$= 8 \cos(6(x - \frac{\pi}{6})) + 4$$

$$= -8 \cos(6(x + \frac{\pi}{6})) + 4$$