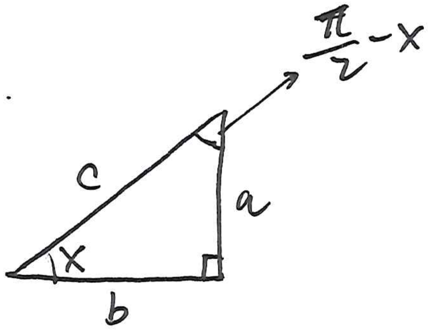
Q1.



$$\sin x = \frac{a}{c} = \cos\left(\frac{\pi}{2}-x\right)$$
$$= \cos\left(x-\frac{\pi}{2}\right)$$

choice B: $\cos\left(x+\frac{\pi}{2}\right)$

$$= -\cos\left(\pi-\left(x+\frac{\pi}{2}\right)\right)$$
$$= -\cos\left(\frac{\pi}{2}-x\right)$$

Sine function transform

① $A=1$ $\quad\left(T=\frac{2\pi}{\omega}\right)$

period $T = 1-(1-2\pi) = 2\pi \Rightarrow \omega = \frac{2\pi}{T} = 1$

The current function is obtained by moving $y=\sin t$ to the right by 1.

$\Rightarrow y = \sin(t-1)$

also correct: $y=\sin(t-1+2\pi)$

(if moving to the left, we move $y=\sin t$ by a distance of $2\pi-1$, then $y=\sin(t+(2\pi-1)) = \sin(t-1+2\pi)$)

Sine function transform (cont'd)

[Try them before looking at the solutions here!]

(2) $A = \frac{1}{\pi}$

period $T = 3 - 1 = 2 \Rightarrow \omega = \frac{2\pi}{T} = \pi$

The function can be obtained by moving

$y = \frac{1}{\pi}\sin(\pi x)$ to the right by 1.

$\Rightarrow y = \frac{1}{\pi}\sin(\pi(x-1)) = \frac{1}{\pi}\sin(\pi x - \pi) = -\frac{1}{\pi}\sin(\pi x)$

Now look back at the graph. Indeed it's a flipped $\frac{1}{\pi}\sin(\pi x)$ upside down.

(3) $A = \frac{1}{2}$.

period $T = 2 \Rightarrow \omega = \frac{2\pi}{T} = \pi$

The function can be obtained by moving

$y = \frac{1}{2}\sin(\pi x)$ to the right by $\frac{1}{2}$

$\Rightarrow y = \frac{1}{2}\sin(\pi(x-\frac{1}{2})) = \frac{1}{2}\sin(\pi x - \frac{\pi}{2})$

Alternatively, one can move $\frac{1}{2}\cos(\pi x)$ to the right by 1.

Then $y = \frac{1}{2}\cos(\pi(x-1)) = \frac{1}{2}\cos(\pi x - \pi)$

$= -\frac{1}{2}\sin(\frac{\pi}{2} - (\pi x - \pi)) = -\frac{1}{2}\sin(-\pi x + \frac{3\pi}{2}) = \frac{1}{2}\sin(\pi x - \frac{\pi}{2})$

Sketch $1+2\sin(2\pi x+0.8\pi)$

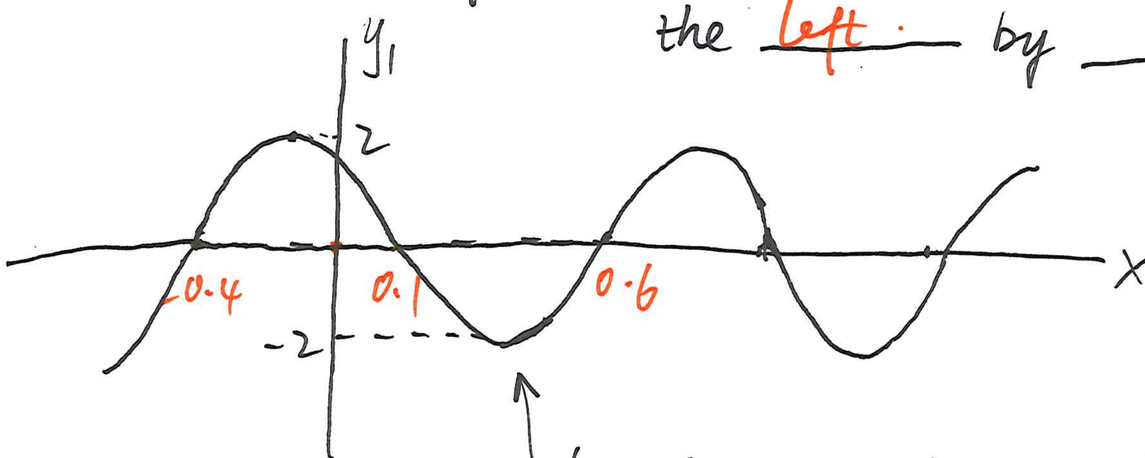
$$y = 2\sin\left(2\pi(x+0.4)\right)+1$$

First sketch $y_1 = 2\sin\left(2\pi(x+0.4)\right)$

amplitude $A=2$

period $T = \frac{2\pi}{2\pi} = 1$

y_1 is the function $y_2 = 2\sin(2\pi x)$ moved to the left by 0.4.



sketch a complete period

Move y_1 upward by 1