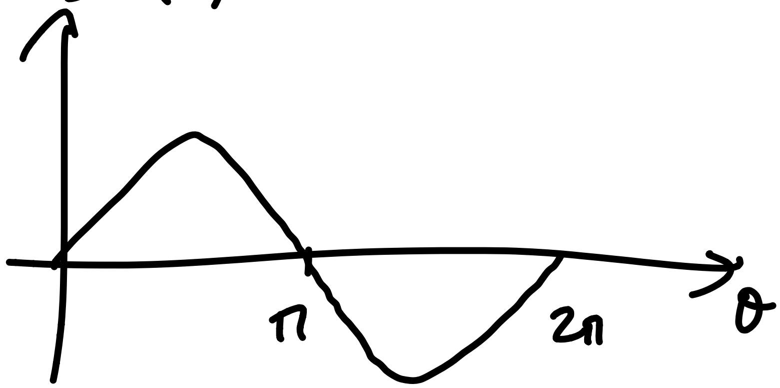
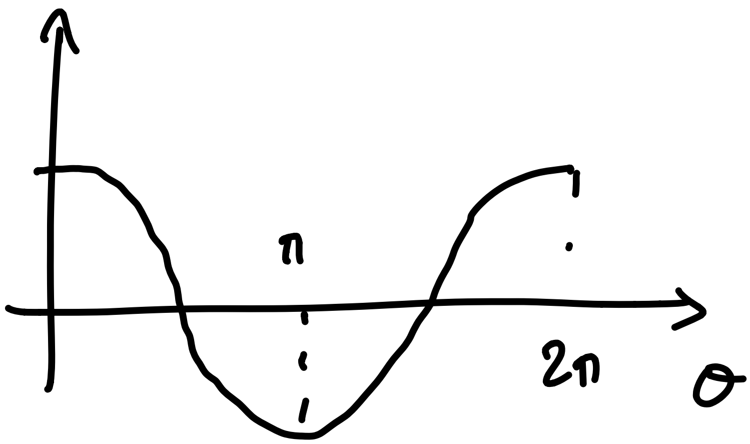
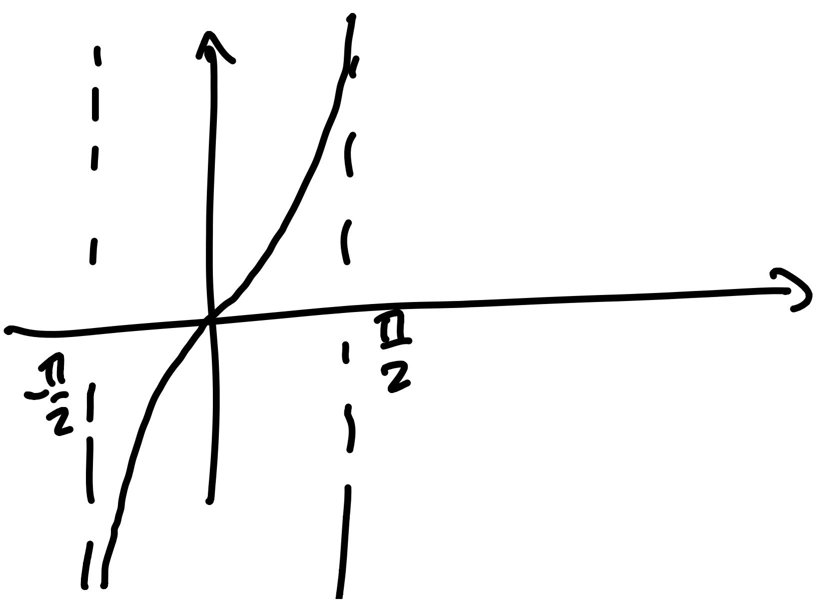
Graph of trig fcts

sin(θ)







Make sense of trig fcts for <u>any</u> real number (that is not an angle) by

$$\sin(t) := \sin(t \text{ radians})$$
$$\cos(t) := \cos(t \text{ radians})$$

<u>Ex:</u> $\sin(90) = \sin(90 \text{ radians})$

<u>19</u> <u>Sinusoidal functions</u>

$$y(t) = A \sin\left(\frac{2\pi}{B}(x-c)\right) + D$$

$B > 0$, $A > 0$

A: Amplitude

Recall $\rightarrow$ range of $\sin(\theta)$ is $[-1, 1]$

so $A\sin(\theta)$ has range $[-A, A]$

B: Period.

$$\sin(x) = 1 \cdot \sin\left(\frac{2\pi}{\underbrace{2\pi}_{B = 2\pi}}(x-0)\right) + 0$$

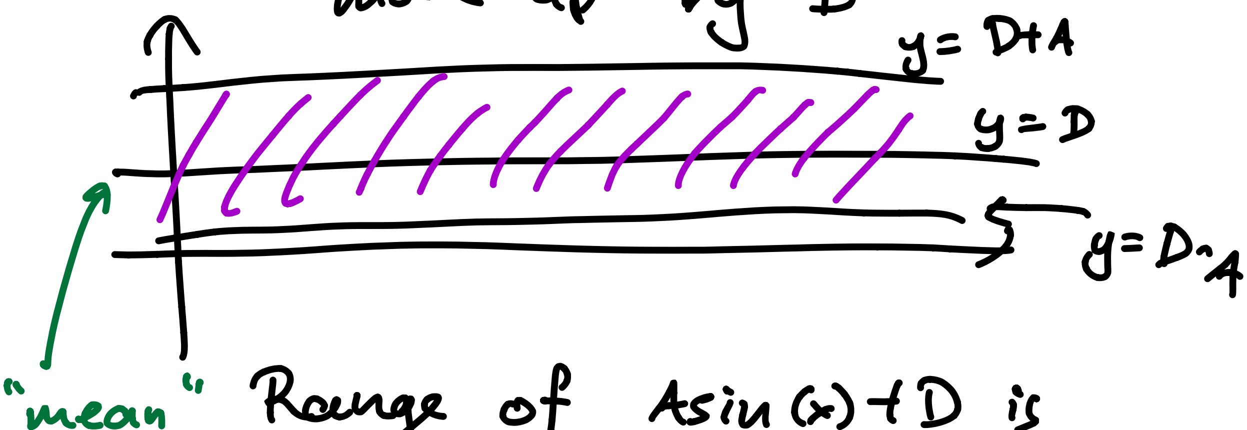
C: phase shift.

Draw $y = A\sin\left(\frac{2\pi}{B}(x-c)\right) + D$

Ex. $f(x) = 6\sin\left(\frac{\pi}{12}x - \frac{11}{12}\pi\right) + 19$

1. Draw $y = D$, $y = D + A$
   $y = D - A$

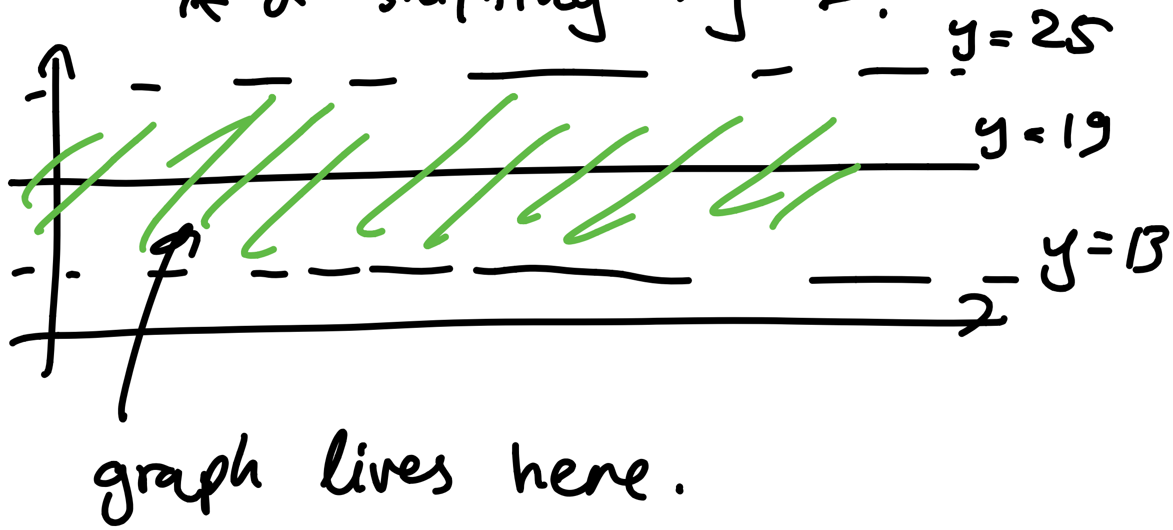
$y = A\sin(x) + D$
scaling first by A,
move up by D



Range of $A\sin(x) + D$ is
$[D-A, D+A]$

Same is going to be true for $A\sin\left(\frac{2\pi}{B}(x-C)\right) + B$ because the only "external changes" is scaling by

A & shifting by D.



Before continuing, put f(x) in standard form.

$$f(x) = 6\sin\left(\frac{\pi}{12}x - \frac{11}{12}\pi\right) + 19$$

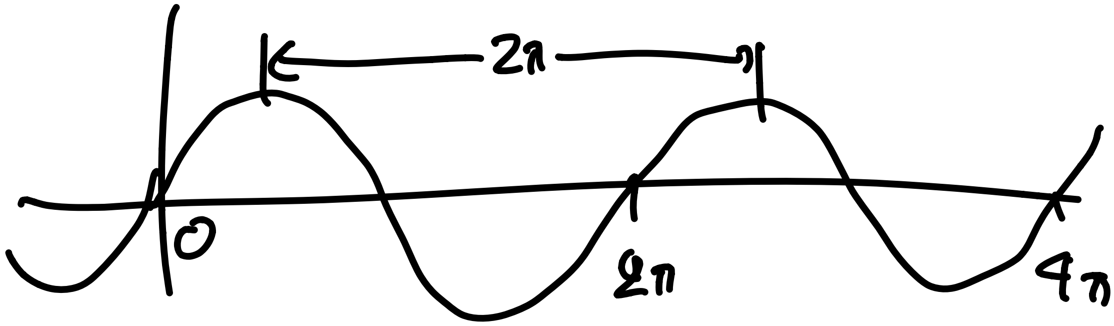
$$= 6\sin\left(\frac{2\pi}{24}x - \pi\cdot\frac{11}{12}\right) + 19$$

$$= 6\sin\left(\frac{2\pi}{24}x - \frac{2\pi}{24}\cdot 11\right) + 19$$

$$= 6\sin\left(\frac{2\pi}{24}(x-11)\right) + 19$$

② Period is B, distance between 2 consecutive max or min.

Recall:



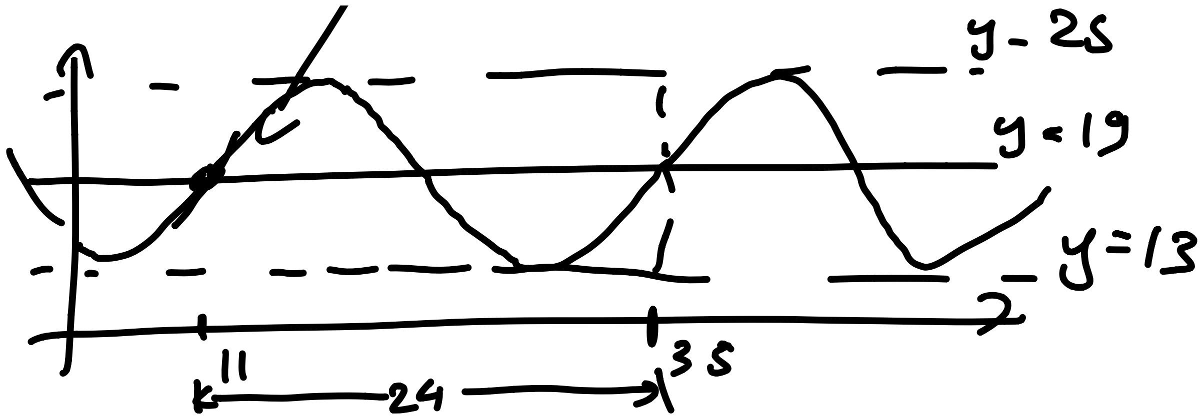
③ Plot (C, D). A point where graph is going up, crossing median line $y = D$.

Recall: $$1 \cdot \sin\left(\frac{2\pi}{2\pi}(x - \underset{\substack{\uparrow \\ C}}{0})\right) + \underset{\substack{\nearrow \\ D}}{0}$$

$(C, D) = (0, 0)$

In our example: $C = 11$
$D = 19$
$B = 24$

(C, D)



$(C, D) = (11, 19)$

Q: Does it matter that A, B had to be positive?

$-\sin(x)$ Not in std form

Ex:

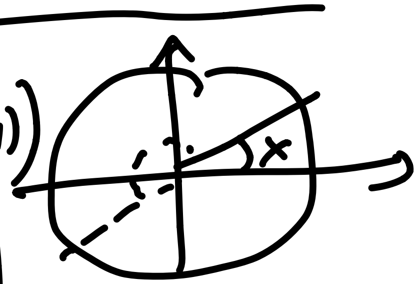
$$f(x) = -\sin\left(\frac{2}{7}x + 1\right)$$

$$= \sin\left(\pi + \frac{2}{7}x + 1\right)$$

Identities! Recall: $\sin(\pi + x) = -\sin(x)$

$$= \sin\left(\frac{2\pi}{7\pi}x + (\pi + 1)\right)$$

$$= \sin\left(\frac{2\pi}{7\pi}x + \frac{2\pi}{7\pi} \cdot \frac{7\pi}{2\pi}(\pi + 1)\right)$$



$$= \sin\left(\frac{2\pi}{7\pi}\left(x + \frac{7\pi}{2\pi}(\pi + 1)\right)\right)$$

$$= \sin\left(\frac{2\pi}{7\pi}\left[x - \left(-\frac{7\pi}{2\pi}(\pi+1)\right)\right]\right) + 0$$

A: 1
B: 7π
C: $-\frac{7\pi}{2\pi}(\pi+1)$
D: 0

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

Ex:

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

$$\boxed{\sin(-x) = -\sin(x)}$$

$$= \sin\left(\frac{\pi}{2} - 2x + 1\right)$$
$$= \sin\left(-\left(2x - \left(-\frac{\pi}{2}\right)\right)\right)$$
$$= -\sin\left(2x - 1 - \frac{\pi}{2}\right)$$
$$= \sin\left(\left[2x - 1 - \frac{\pi}{2}\right] + \pi\right)$$

$$\boxed{\sin(x+\pi) = -\sin(x)}$$