III. Phrase Shift 1

To graph any sinosoidal functions, "$y = A\sin Bx$" "$y = A\cos Bx$", where A and B are constants. We follow the steps:

1. Find the amplitude $|A|$, the period $\frac{2\pi}{|B|}$.
2. Divide into 4 equal parts (5 points total)
3. Fill up 4 equal parts
4. Sketch the graph.

← $? \cdot |B| = 2\pi$

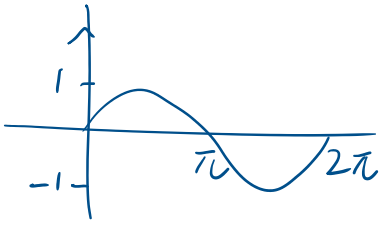
5 pts

Notice: For $y = A\sin Bx$,

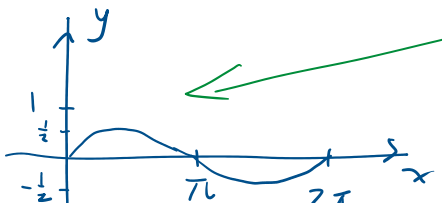
- amplitude : $|A|$ ← in front of the function
- period : $\frac{2\pi}{B}$ $\left(\frac{2\pi}{|B|}\right)$ ← $? * |B| = 2\pi$

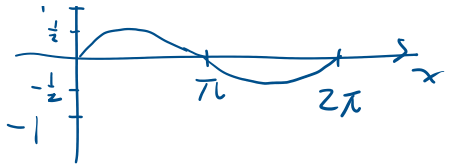
eg. Graph $y = \frac{1}{2}\sin x$ for one period.

Sol: Ori:



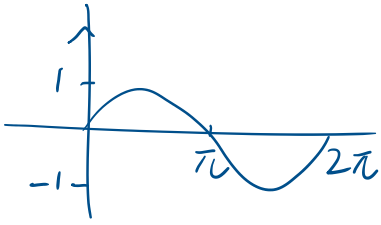
Now: $\frac{1}{2}\sin x \iff |A| = \left|\frac{1}{2}\right| = \frac{1}{2}$ ← a vertical sketch "$\frac{1}{2}$ · the height"



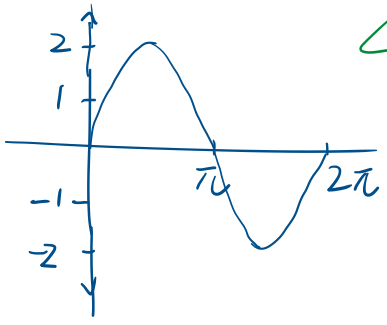


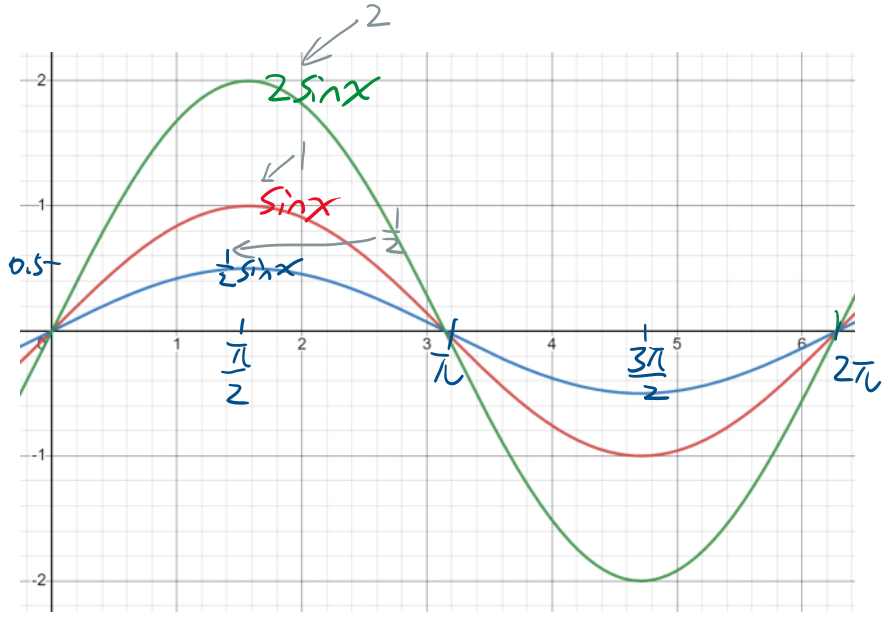
eg. Graph $y = 2\sin x$ for one period.

Sol: Ori:



$|A| = |2| = 2$ ← $2 \cdot 1 = 2$, double

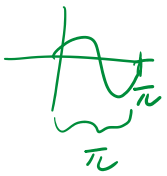




eg. Graph $y = \sin 2x$ for $0 \le x \le 2\pi$.

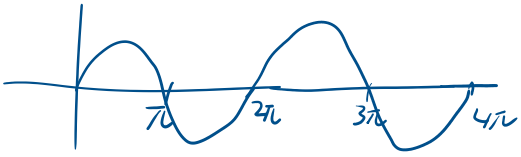
Sol: $2x$ is inside sin, $|A| = 1$

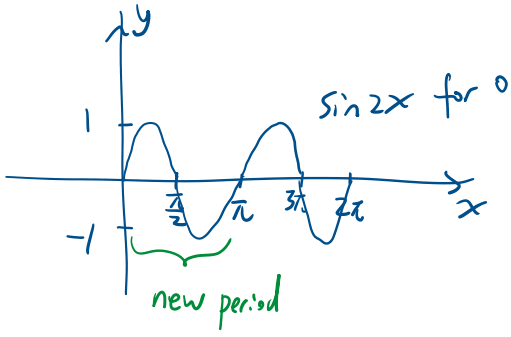
period $= \frac{2\pi}{2} = \pi$ ← "new period"



x	0	$\frac{\pi}{4}$	$\frac{2\pi}{4}$	$\frac{3\pi}{4}$	π	...
$2x$	0	$\frac{\pi}{2}$	π	$\frac{3\pi}{2}$	2π	...
$\sin 2x$	0	1	0	-1	0	...

← do this: 4 parts: $\frac{\pi}{4}$





$y = \sin 10x$

period $= \frac{2\pi}{10} = \frac{\pi}{5}$

$y = \sin \frac{2}{5}x$

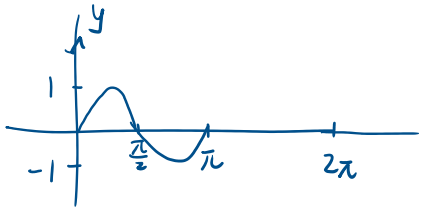
period $= \frac{2\pi}{\frac{2}{5}} = 5\pi$

$y = \sin 1323x$

period $= \frac{2\pi}{1323} \approx$ 0.002

eg. Graph $y = \sin 2x$ for one period.

Sol: $|A| = 1$, period $= \frac{2\pi}{2} = \pi$



← "shrink" / compress a half

eg. Graph $y = \sin \frac{2}{5}x$ for one period.

Sol: $|A| = 1$, period $= \frac{2\pi}{\frac{2}{5}} = 5\pi$

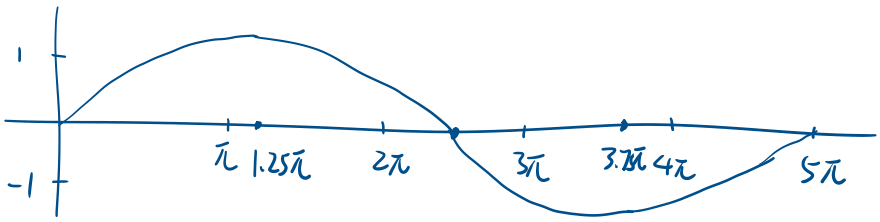
..., 5π, 10π, 15π, 20π

$\frac{5\pi}{4} = \frac{5\pi}{4}$

$|A| = 1$, period $= \frac{2\pi}{\frac{2}{5}} = 5\pi$

$\frac{5\pi}{4} = \frac{5\pi}{4}$

x	0	$\frac{5\pi}{4}$	$\frac{10\pi}{4}$	$\frac{15\pi}{4}$	$\frac{20\pi}{4}$
$\frac{2}{5}x$	0	$\frac{\pi}{2}$	π	$\frac{3\pi}{2}$	2π
$\sin\frac{2}{5}x$	0	1	0	-1	0



$\frac{5\pi}{2} = 2.5\pi$

$\frac{2.5\pi}{2} = 1.25\pi$

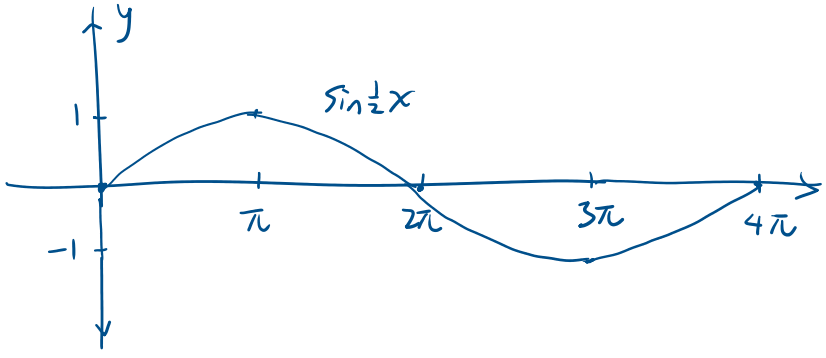
eg. Graph $y = \sin\frac{1}{2}x$ for one period.

Sol: $|A| = 1$, period $= \frac{2\pi}{\frac{1}{2}} = 4\pi$

$2\pi \cdot 2 = 4\pi$

x	0	π	2π	3π	4π
$\frac{1}{2}x$	0	$\frac{\pi}{2}$	π	$\frac{3\pi}{2}$	2π
$\sin\frac{1}{2}x$	0	1	0	-1	0

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



eg. Graph $f(x) = \cos\left(\frac{1}{3}\pi x\right)$ for one period.

Sol: $|A| = 1$, period $= \frac{2\pi}{\frac{1}{3}\pi} = 6$

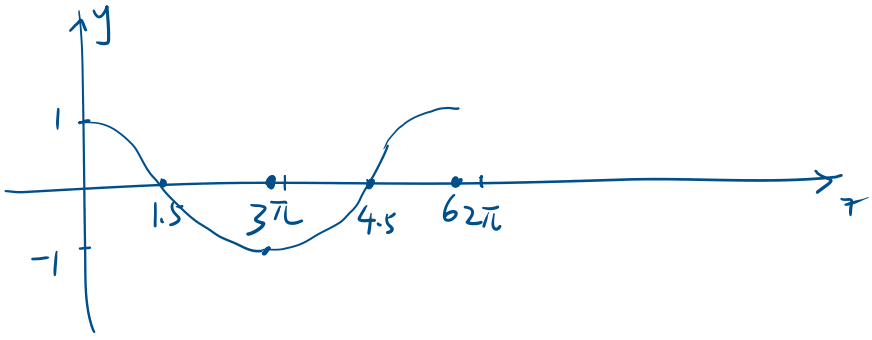
$2\pi \cdot \frac{3}{\pi} = 6$

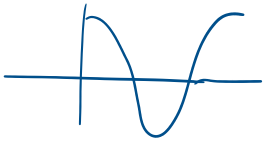
Sol: $|A| = 1$, period $= \frac{2\pi}{\frac{1}{3}\pi} = 6$

$2\pi \cdot \frac{3}{\pi} = 6$

$\frac{6}{4} = 1.5$

x	0	1.5	3	4.5	6
$\frac{1}{3}\pi x$	0	$\frac{\pi}{2}$	π	$\frac{3\pi}{2}$	2π
$\cos(\frac{1}{3}\pi x)$	1	0	-1	0	1





$2\pi = 6.28$