midline → constant being + or − to trig function

radius (height ↑↓ from midline) → coefficient of trig function

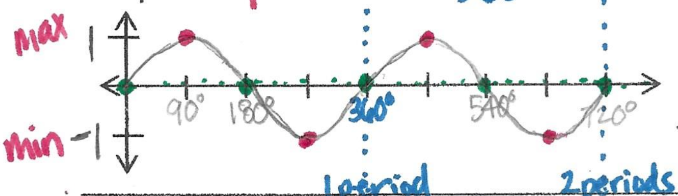
speed → coefficient of x

Sine and Cosine Graphs

Graph $y = \sin x$

midline: 0 ($y=0$)

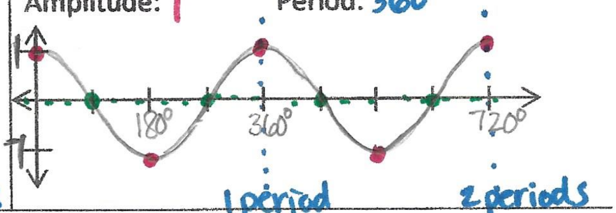
Amplitude: 1 Period: 360°



Graph $y = \cos x$

midline: $y=0$

Amplitude: 1 Period: 360°



Now we will look at some transformations to these functions. *We will save horizontal translations for a later lesson.* The equations we will work with today will look like either $y = a\sin(bx) + k$ or $y = a\cos(bx) + k$. But what impact does each piece have on the graphs of sine or cosine?

- $|a|$ is the amplitude and represents the stretch factor. The amplitude is half the vertical distance between the maximum height (crest) and the lowest height (min) (trough). If $a < 0$, the function is reflected vertically.

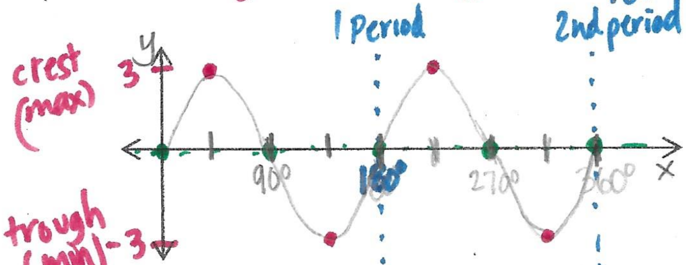
start ↓↑

- k is the vertical shift. If k is positive, the graph is translated k units up. If k is negative, the graph is translated k units down. (MIDLINE)

- b is the frequency and changes the period of the function (How long it takes to complete one cycle.). It takes 360° degrees for $y = \sin x$ or $y = \cos x$ to complete one cycle. Therefore $period = \dfrac{360°}{b}$ or $b = \dfrac{360°}{period}$.

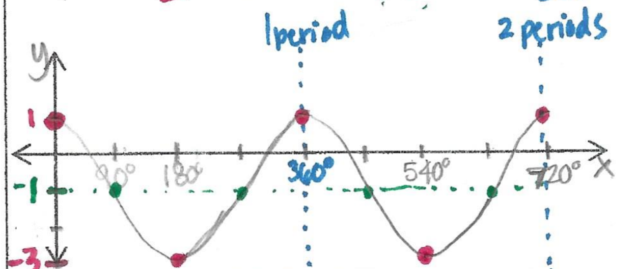
Graph $y = 3\sin(2x)$ $b=2$ $P = \frac{360°}{2}$

Amplitude: 3 Vertical shift: 0 Period: 180°



Graph $y = 2\cos x - 1$ $b=1$

Amplitude: 2 Vertical shift: −1 Period: 360°

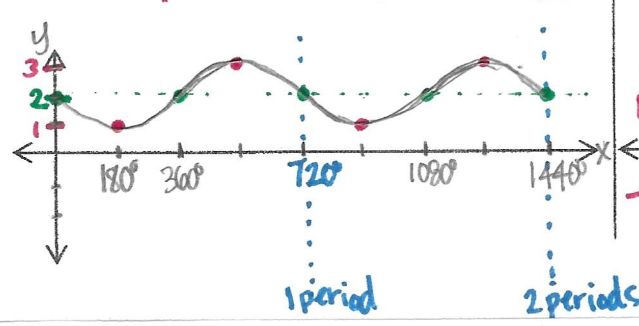


Graph $y = -\sin(\frac{x}{2}) + 2$ $b = \frac{1}{2}$

Reflect down!

$p = 360° \div \frac{1}{2}$

Amplitude: 1 Vertical shift: 2 Period: 720°



Graph $y = \cos(4x)$ $b=4$

Amplitude: 1 Vertical shift: 0 Period: $P = \frac{360°}{4}$ 90°