Graph of Equations

1 Trig function transformations

Assume...

$$y = d + a * sin(bx - c) \tag{1}$$

Graphing a trig function with transformations

Pure equations...

$$\begin{aligned} \text{period} &= \frac{2\pi}{b} \\ \text{x-scale} &= \frac{\text{period}}{4} \\ \text{initial point} &= \frac{c}{b} \\ \text{max y} &= a + d \\ \text{min y} &= -a + d \end{aligned}$$

Sketch the graph of the function. (*"Min" and "Max" assume no reflection*)

$$y = -1 + 3 * \cos(\pi x + \frac{\pi}{2})$$

$$d = -1 \quad a = 3 \quad b = \pi \quad c = -\frac{\pi}{2}$$

$$\begin{aligned} \text{period} &= \frac{2\pi}{b} = \frac{2\pi}{\pi} = 2 \\ \text{x-scale} &= \frac{\text{period}}{4} = \frac{2}{4} = \frac{1}{2} \\ \text{initial point} &= \frac{c}{b} = \frac{-\frac{\pi}{2}}{\pi} = -\frac{\pi}{2} * \frac{1}{\pi} = -\frac{1}{2} \\ \text{max y} &= a + d = 3 + -1 = 2 \\ \text{min y} &= -a + d = -3 + -1 = -4 \end{aligned}$$

Then to graph, draw line at $y = d$, $y = \text{max y}$, and $y = \text{min y}$. Draw a point at your initial point. The draw 4 more points, all by adding the x-scale to the last point.

Writing a trig function with constraints

Pure equations...

$$\begin{aligned} b &= \frac{2\pi}{\text{period}} \\ c &= b * \text{shift} \end{aligned}$$

Write an equation for a function with the given characteristics.

A sine curve with a **period of 8π**, an **amplitude of 4**, a **left phase shift of $\frac{\pi}{2}$**, and a **vertical translation down 1 unit**.

We can instantly get some values

– a will be 4

– d will be -1

For the other values there is a bit of math...

$$\begin{aligned} b &= \frac{2\pi}{period} = \frac{2\pi}{8\pi} = \frac{1}{4} \\ c &= b * \text{shift} = \frac{1}{4} * \frac{\pi}{2} = \frac{\pi}{8} \end{aligned}$$

Then plug them in (and put the + for left shift, - for right shift)

$$y = -1 + 4\sin(\frac{1}{4}x + \frac{\pi}{8})$$