Trig Graphs

All trig graphs are sinusoidal which means they are smooth curves based on the original sine graph.

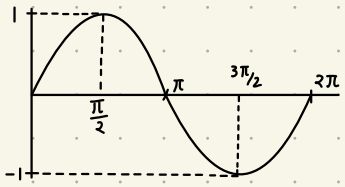
Amplitude → The amplitude is the distance from the max or min to the middle or $\frac{\text{max}-\text{min}}{2}$.

Period → The period is the time taken for a curve to complete a full cycle or oscillation that includes a max & min

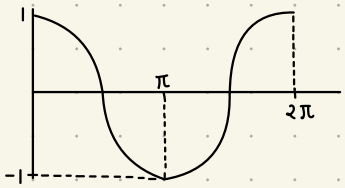
The **tan** graph is unique as it has **vertical asymptotes** at $\pi/2 + \pi \cdot n$ and **x-intercepts** at $\pi \cdot n$ where **n** can be **positive** or **negative**.

Basic Graphs

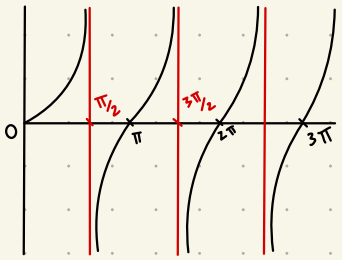
$y = \sin(x)$



$y = \cos(x)$



$y = \tan(x)$



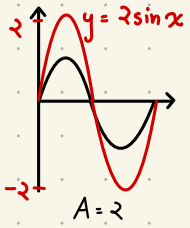
Graph Transformations

→ Graph Transformations can be summarized with the equation below:

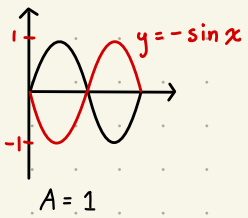
$$F(x) = \pm A \sin B(x \pm C) \pm D$$

Note: Sin graphs are used for the explanations and sketches, but the same applies to tan & cos.

1. **Vertical Transformation** $(\pm A)$ → This tells us how much a graph is **vertically stretched** or **compressed**. **A** is the **amplitude** of the new graph.
   → If **A** is **negative**, the graph is **reflected** over the **x-axis**.

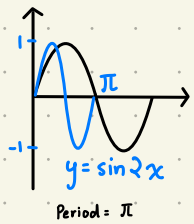


A = 2

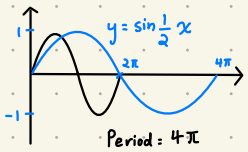


A = 1

2. **Horizontal Transformation** (B) → This tells us how much a graph is **horizontally stretched** or **compressed**. If $B > 1$, **compress** and if $B < 1$, **stretch**. There are 2 important equations as **B** affects the **PERIOD** of a graph.
   $B = \frac{2\pi}{\text{Period}}$ or $\text{Period} = \frac{2\pi}{B}$.



Period = π

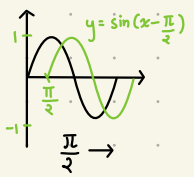


Period = 4π

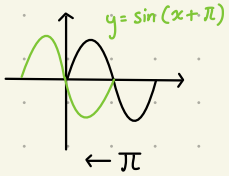
3. **Phase Shift** (C) → This tells us how much a graph **moves horizontally** from its **original position**. If $C < 0$, graph **moves** to the **right** and if $C > 0$, graph moves to the **left**.
   → You have to **factor** the **B** out before **applying C**

$f(x) = \sin(2x + 2\pi)$, 2π to the left ✗

$f(x) = \sin 2(x + \pi)$, π to the left ✓

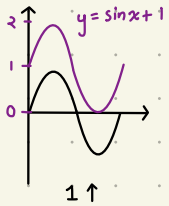


→

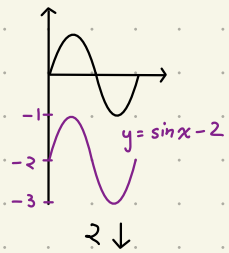


← π

4. **Vertical Shift** (D) → This tells us how much a graph **moves vertically** from its **original position**. If $D > 0$, graph **moves up**, if $D < 0$, graph **moves down**.



1 ↑



2 ↓

NOTE: If x-axis units are not π or period of graph is not in π, then B will have a π in it.