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U of I MAC Handouts:

Sketching Trigonometric Functions

The goal of this handout is to help you understand the transformations of the trigonometric functions using the general forms:

$$y = A\sin(Bx \pm C) + D$$

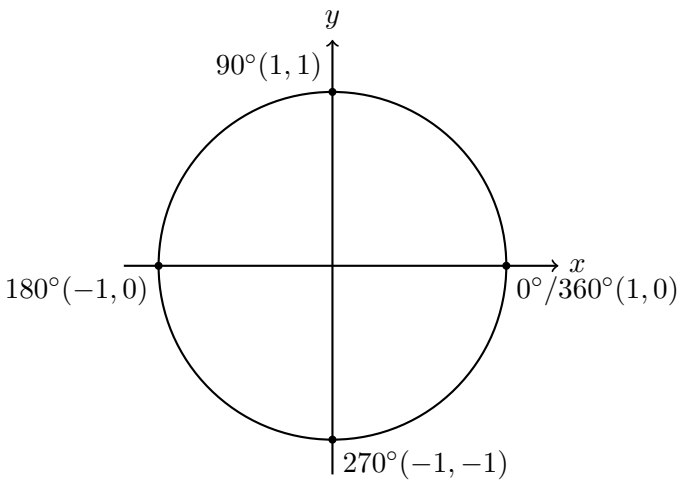
$$y = A\cos(Bx \pm C) + D$$

where each parameter represents the following transformations:

- **A**: Amplitude — Maximum height the graph reaches from the x-axis.
- **B**: Period — $T = \frac{2\pi}{B}$, Is the distance along the x-axis that is required for the function to make one full oscillation.
- **C**: Phase shift — Measures how far the graph has shifted horizontally by $\frac{C}{B}$.
- **D**: Vertical shift — Measures how far the graph has shifted vertically either up/down from its initial position.

Unit Circle and Ferris Wheel Analogy

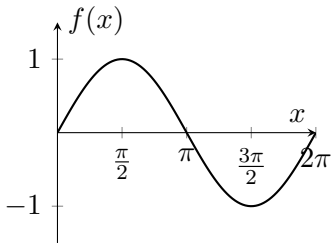
Sine and Cosine can be visualized using the unit circle, like a Ferris wheel. Our input value, x, in the trig functions represents the distance traveled around the circle in radians. $\sin x$ gives you the vertical position in radians , while $\cos x$ tells you the horizontal position in radians.



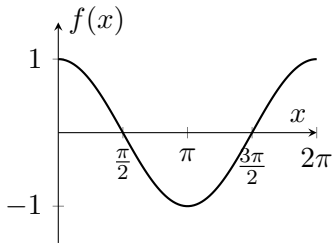
Interactive Tool

To explore these transformations interactively, scan the QR code below, or visit the link directly:

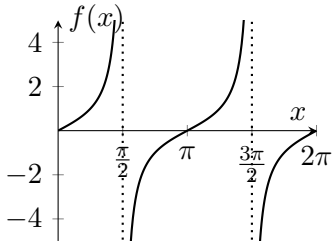
Graphs



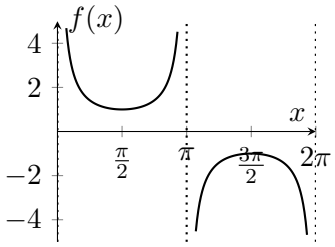
$f(x) = \sin(x)$



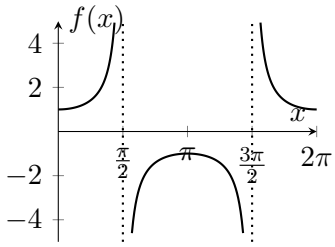
$f(x) = \cos(x)$



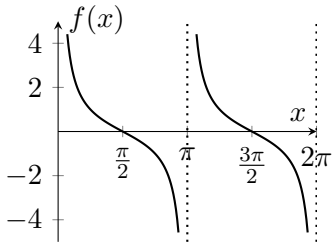
$f(x) = \tan(x)$



$f(x) = \csc(x)$



$f(x) = \sec(x)$



$f(x) = \cot(x)$