

1 Cosine Function

1.1 Graph

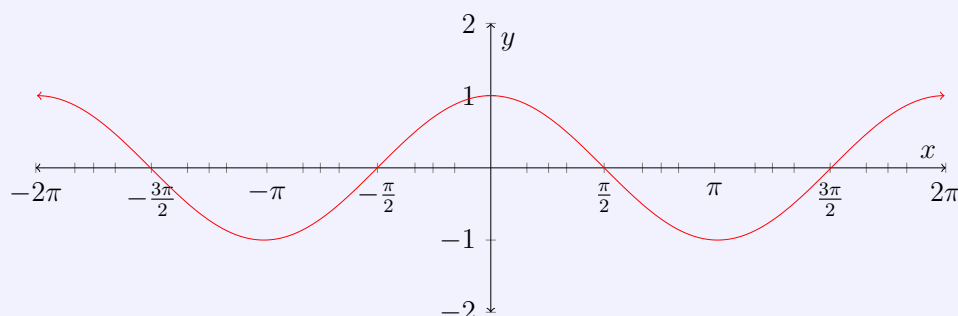


Figure 1: $f(x) = \cos(x)$

1.2 Properties of Graph

- domain: $x \in \mathbb{R}$, i.e., $x \in (-\infty, \infty)$
- range: $y \in [-1, 1]$
- x -intercepts: $x = (2n + 1) \frac{\pi}{2}$, $n \in \mathbb{Z}$
- y -intercept: $y = 1$
- period: 2π
- vertical asymptotes: none
- horizontal asymptotes: none
- symmetry: y -axis, i.e., even function

1.3 Tranformations

A dynamic *Mathematica* file is located at <http://www.jjw3.com/nb/cos.nb>.

1.4 Unit Circle

$\cos(\theta)$ corresponds to the x -coordinate on the unit circle. In the xy -plane, $x < 0$ in Quadrant II and Quadrant III.

1.5 Mathematica Code

1.5.1 Angles in Degrees

`Cos[x Degree]`, e.g., `Cos[30 Degree]`.

1.5.2 Angles in Radians

`Cos[x]`, e.g., `Cos[Pi/6]`.

$x < 0$ means x is negative.

All *Mathematica* functions start with an upper case letter and have square brackets for arguments.

2 Inverse Cosine Function

2.1 Graph

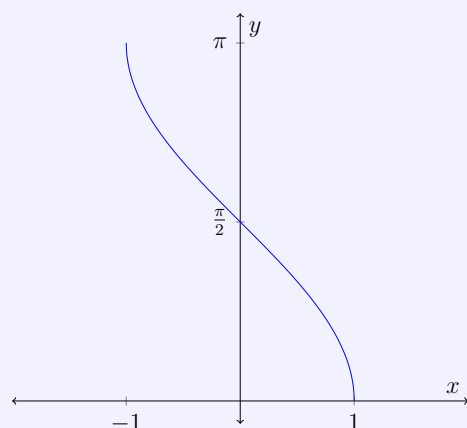


Figure 2: $f(x) = \cos^{-1}(x)$

$$\cos^{-1}(x) \neq \frac{1}{\cos(x)}.$$

2.2 Properties of Graph

- domain: $x \in [-1, 1]$
- range: $y \in [0, \pi]$
- x -intercepts: $x = 1$
- y -intercept: $y = \frac{\pi}{2}$
- period: n/a
- vertical asymptotes: none
- horizontal asymptotes: none
- symmetry: none

The domain of the inverse is the same as the range of $\cos(x)$.

To find the inverse, the domain of $\cos(x)$ must be restricted to $[0, \pi]$ to make the function 1-to-1.

2.3 Mathematica Code

2.3.1 To Obtain Angles in Radians

ArcCos[x], e.g., ArcCos[1/2].

Mathematica returns on the standard reference angle.

2.3.2 To Obtain Angles in Degrees

ArcCos[x]/Degree//N, e.g., ArcCos[1/2]/Degree//N.