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URL: http://www.jjw3.com/r/sin.pdf

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1 Sine Function

1.1 Graph

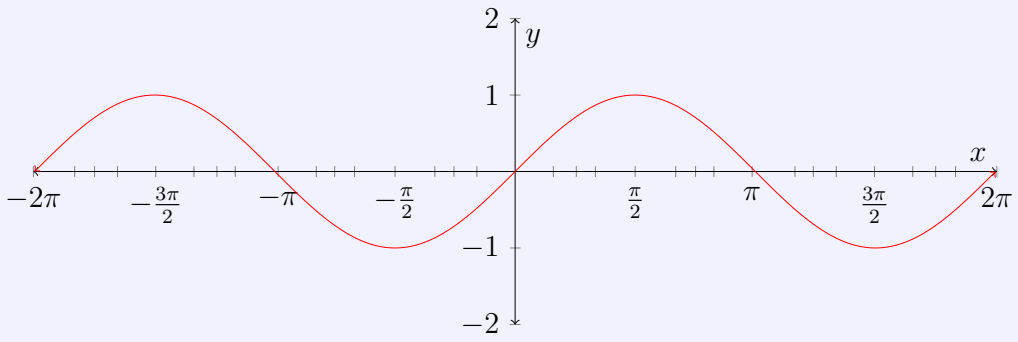

Figure 1: $f(x) = \sin(x)$

1.2 Properties of Graph

- domain: $x \in \mathbb{R}$, i.e., $x \in (-\infty, \infty)$
- range: $y \in [-1, 1]$
- x-intercepts: $x = n\pi$, $n \in \mathbb{Z}$
- y-intercept: $y = 0$
- period: 2π
- vertical asymptotes: none
- horizontal asymptotes: none
- symmetry: origin, i.e., odd function

1.3 Tranformations

A dynamic *Mathematica* file is located at http://www.jjw3.com/r/sin.html.

1.4 Unit Circle

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

$y < 0$ means y is negative.

1.5 Mathematica Code

1.5.1 Angles in Degrees

Sin[x Degree], e.g., Sin[30 Degree].

1.5.2 Angles in Radians

Sin[x], e.g., Sin[Pi/6].

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

2 Inverse Sine Function

2.1 Graph

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

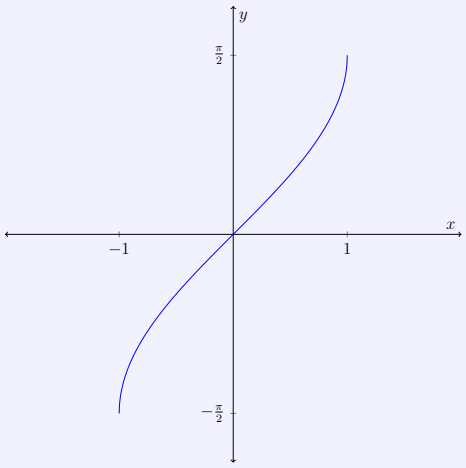

Figure 2: $f(x) = \sin^{-1}(x)$

2.2 Properties of Graph

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

To find the inverse, the domain of $\sin(x)$ must be restricted to $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$ to make the function 1-to-1.

- domain: $x \in [-1, 1]$
- range: $y \in \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$
- x-intercepts: $x = 0$
- y-intercept: $y = 0$
- period: n/a
- vertical asymptotes: none
- horizontal asymptotes: none
- symmetry: origin, i.e., odd function

2.3 Mathematica Code

2.3.1 To Obtain Angles in Radians

Mathematica returns on the standard reference angle.

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

2.3.2 To Obtain Angles in Degrees

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