# Trigonometric Functions

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The trigonometric functions are functions that represent the relationship between the sides and angles of a triangle. The names of the six trigonometric functions are **sine, cosine, tangent, secant, cosecant,** and **cotangent**. Trigonometric functions are fundamental to mathematics, we see them everywhere. These functions were developed while attempting to measure and solve practical applications in astronomy, navigation, and land measurement. These functions are also very ancient, we see them in Egyptian, Babylonian, and ancient Greek mathematics.
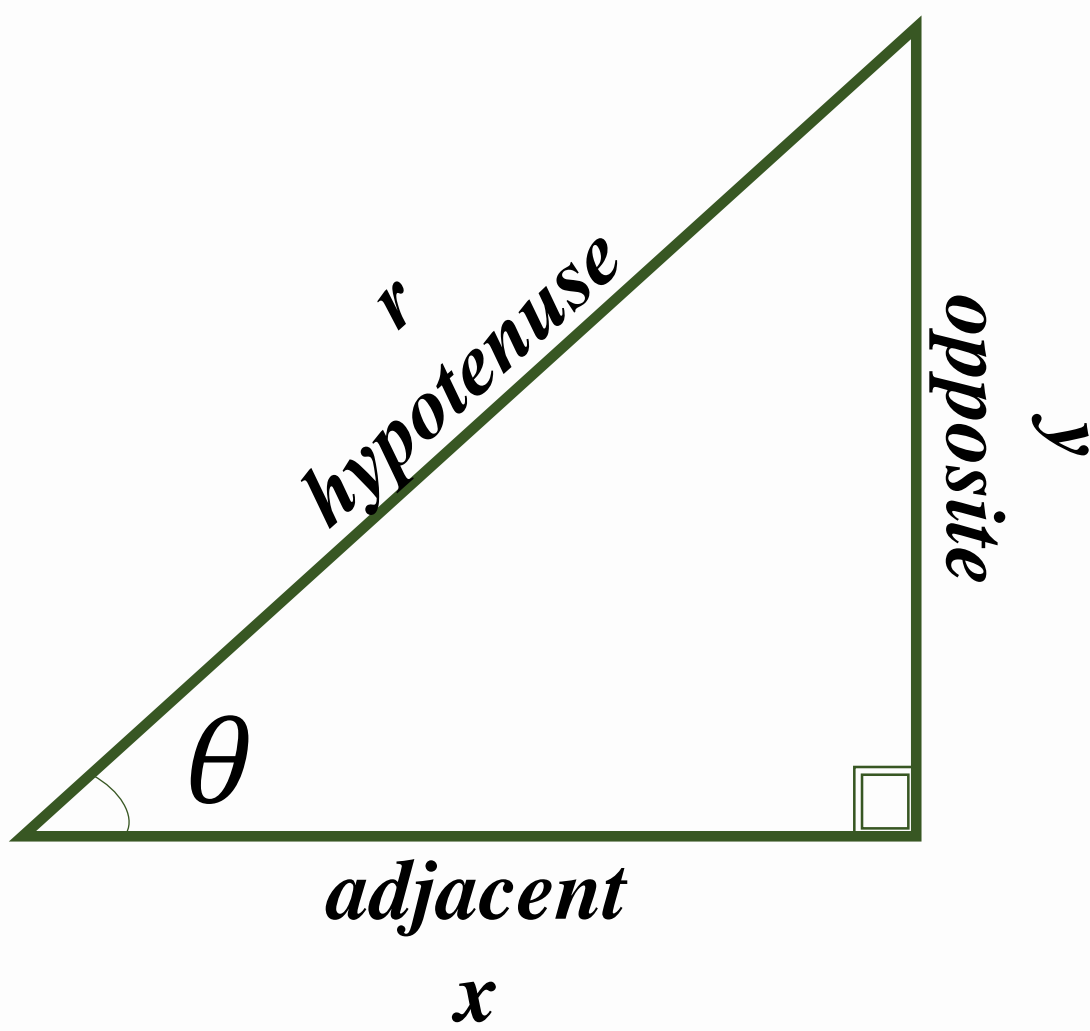
Sine (sin) Cosine (cos) Tangent (tan)		Cosecant (csc) Secant (sec) Cotangent (cot)	
$sin\theta = \dfrac{y}{r} =$	$\dfrac{opposite}{hypotenuse}$	$csc\theta = \dfrac{r}{y} =$	$\dfrac{hypotenuse}{opposite}$
$cos\theta = \dfrac{x}{r} =$	$\dfrac{adjacent}{hypotenuse}$	$sec\theta = \dfrac{r}{x} =$	$\dfrac{hypotenuse}{adjacent}$
$tan\theta = \dfrac{y}{x} =$	$\dfrac{opposite}{adjacent}$	$cot\theta = \dfrac{x}{y} =$	$\dfrac{adjacent}{opposite}$

History Of Trigonometric Functions

- The first time we see the word "Trigonometry" is in the book *Trigonometria: sive de solution triangulorum tractatuus brevis et perspicuus* published by B. Pitiscus (1561-1613) in 1595.
- Trigonometry means "the study of trigons" in Latin. Trigonon was the word used for triangle.
- Trigonometry first appeared in English in the 1614 translation of Pitiscus' text by Ra. Handson. (Merlet, 2004)

Figure 1: *B.* Pitiscus

The Application Of Trigonometric Functions

Trigonometric Functions are a foundational element of mathematics. We do not only use them to solve mathematical problems, like derivatives and integrals in calculus, we also can use trigonometric functions to solve physical or engineering functions. For example, we can use trigonometric functions to find the force on different directions (the force in the space) which is used in engineering, such as civil engineering to design a structure.

Example in Mathematics

$$\frac{dy}{dx}(sinxcos^2x)$$
$$= cosx * cos^2x - sinx * 2cosxsinx$$
2cosxsinx can be written as sin2x
$$= cos^3x - sinxsin2x$$

In this question, we can use trigonometric functions to find the answer

$\mathbf{r} = \ell\,(\cos\theta, \sin\theta)$
$\mathbf{v} = \dot{\mathbf{r}} = \ell\dot\theta\,(-\sin\theta, \cos\theta)$

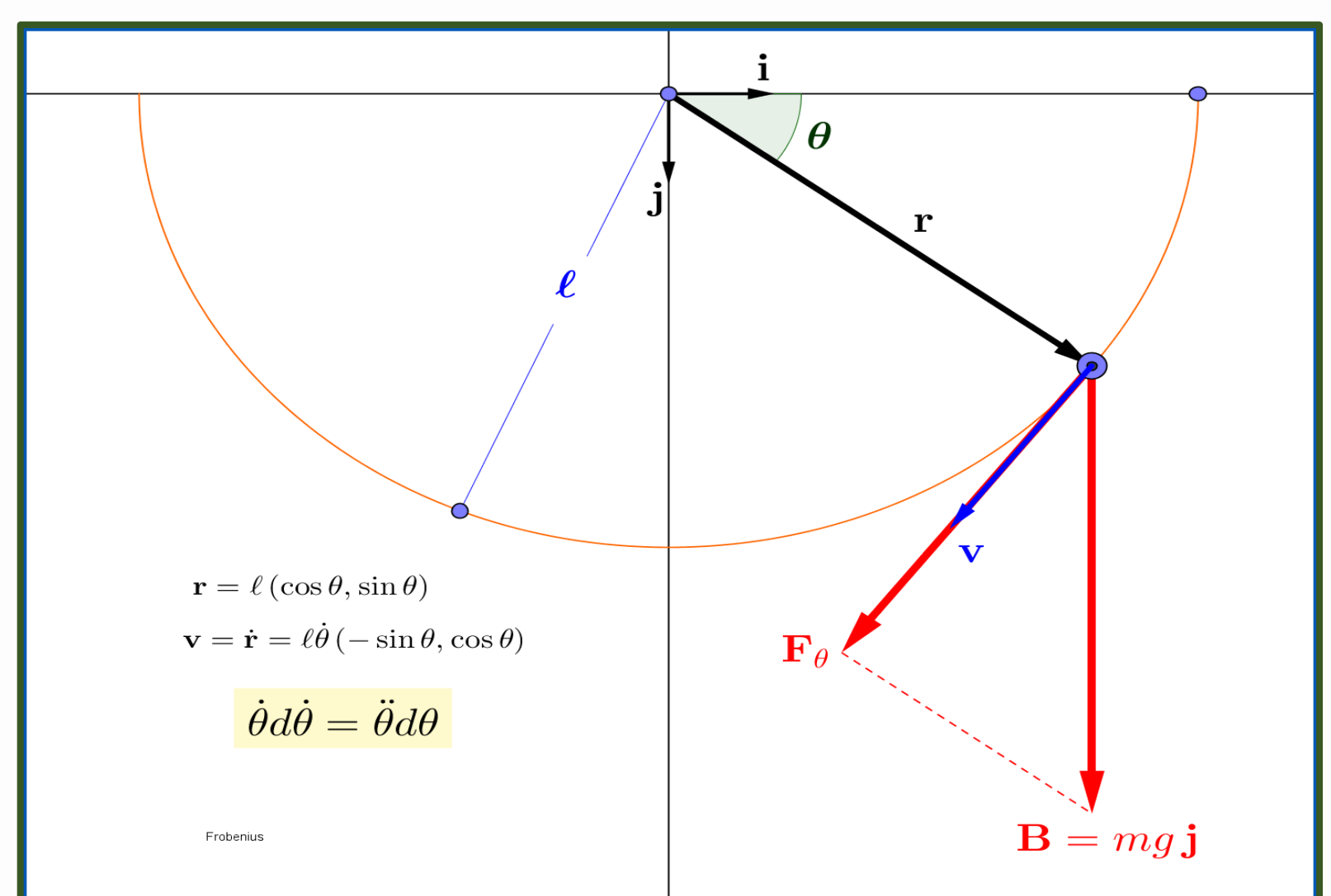$\dot\theta\,d\dot\theta = \ddot\theta\,d\theta$

Frobenius

Figure 2: Angular Momentum

Resources:
1. Merlet J., (2004) *A NOTE ON THE HISTORY OF TRIGONOMETRIC FUNCTIONS AND SUBSTITUTIONS, retrieved March 16, 2020, from www.researchgate.net*
2. Figure 1 from Fine Art American
3. Figure 2 from Physics Stack Exchange

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