

Mathematical Odds and Ends

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1 Trigonometric Identities

$$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B \quad (1)$$

$$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B \quad (2)$$

2 Law of Sines and Cosines

Given the triangle shown in Figure 1, the *law of sines* states that

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} = \text{constant} . \quad (3)$$

The *law of cosines* states that

$$c^2 = a^2 + b^2 - 2ab \cos C \quad (4)$$

3 Special Functions

3.1 Dirac Delta Function

The Dirac delta function is a generalized function defined by

$$\int_{-\infty}^{\infty} \delta(x - a) f(x) dx = f(a) \quad (5)$$

for some function $f(x)$, and

$$\delta(x - a) = \begin{cases} 0, & x \neq a, \\ \text{undefined}, & x = a . \end{cases} \quad (6)$$

The fact that the Delta function is a *generalized* function means that it is only really defined with respect to integration. Pragmatically this presents no difficulty if it used in probability density functions or other functions that must be integrated to yield physically meaningful results. It is often used to define functions that exist only at a point because

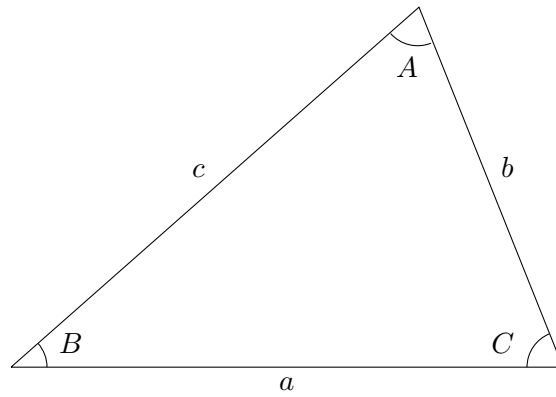


Figure 1: A triangle.