**Mathematical Derivation of the Fourier Series Approximation**

For a periodic function f(t) with period T, the Fourier series approximation expresses f(t) as a sum of sine and cosine functions. The formula for the Fourier series expansion is:

A math equation with text

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where:

* a0​ is the average or DC component of the signal.
* an​ and bn​ are the Fourier coefficients for the cosine and sine terms, respectively, representing the amplitude of each frequency component.

**Calculating the Fourier Coefficients**

The Fourier coefficients are determined as follows:

**a0​**:

The average value of the function over one period, given by:

A close-up of a mathematical equation

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**an​**:

The coefficients of the cosine terms, found by:

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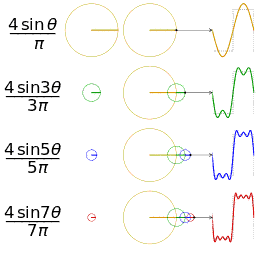
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**bn​**:

The coefficients of the sine terms, given by:

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