Fourier Series

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- For any function defined on the interval $(-p, p)$, an expression can be obtained that looks like (1)

$$f(x) = \frac{a_0}{2} + \sum_{n=1}^{\infty} \left(a_n \cos \frac{n\pi}{p} x + b_n \sin \frac{n\pi}{p} x \right) \tag{1}$$

- The components of a Fourier Series may be found by using formulas (2), (3), and (4)

$$a_0 = \frac{1}{p} \int_{-p}^{p} f(x)\, dx \tag{2}$$

$$a_n = \frac{1}{p} \int_{-p}^{p} f(x) \cos \frac{n\pi x}{p}\, dx \tag{3}$$

$$b_n = \frac{1}{p} \int_{-p}^{p} f(x) \sin \frac{n\pi x}{p}\, dx \tag{4}$$

- The series converges at the point defined by (5)

$$\frac{\lim_{h\to 0} f(x+h) + \lim_{h\to 0} f(x-h)}{2} \tag{5}$$