- Often used for steady-state problems
- Recall $f(t+T)=f(t)$

$$f(t)=\frac{A_0}{2}+\sum_{k=1}^{\infty}\left[A_k\cos\left(2\pi k\frac{t}{T}\right)+B_k\sin\left(2\pi k\frac{t}{T}\right)\right]$$

- The Fourier coefficients $A_k, B_k$ are obtained as scalar products

$$A_k=\frac{2}{T}\int_0^T f(t)\cos\left(2\pi k\frac{t}{T}\right)\mathrm{d}t,\ B_k=\frac{2}{T}\int_0^T f(t)\sin\left(2\pi k\frac{t}{T}\right)\mathrm{d}t$$

- By analogy define a Fourier transform

$$F(\alpha)=\mathcal{F}\{f(x)\}=\int_{-\infty}^{\infty}f(x)\,e^{i\alpha x}\mathrm{d}x,\ f(x)=\mathcal{F}^{-1}(F(\alpha))=\int_{-\infty}^{\infty}F(\alpha)\,e^{-i\alpha x}\mathrm{d}\alpha$$