Fourier-integral:

$$f(t) = a_0 + \sum_{n=1}^{\infty} a_n \cos(n\omega_0 t) + \sum_{n=1}^{\infty} b_n \sin(n\omega_0 t)$$

$$= \frac{1}{T}\int_0^T f(u)\,du + \sum_{n=1}^{\infty}\left[\frac{2}{T}\int_0^T f(u)\cos(n\omega_0 u)\,du\right]\cos(n\omega_0 t)$$

$$+ \sum_{n=1}^{\infty}\left[\frac{2}{T}\int_0^T f(u)\sin(n\omega_0 u)\,du\right]\sin(n\omega_0 t)$$

$$\omega_n = n\omega_0$$

$$\Delta\omega = \omega_n - \omega_{n-1} = \omega_0 = \frac{2\pi}{T} \qquad \Rightarrow \qquad \frac{2}{T} = \frac{1}{\pi}\Delta\omega$$

$$\sum_{n=1}^{\infty} \Delta\omega \cdot y(\omega_n) \xrightarrow[(T\to\infty)]{\Delta\omega\to 0} \int_0^{\infty} d\omega\, y(\omega)$$

$T \to \infty$

$$\Rightarrow f(t) = \frac{1}{\pi}\int_0^{\infty} \cos\omega t \int_0^{\infty} f(u)\cos\omega u\,du\,d\omega$$

$$+ \frac{1}{\pi}\int_0^{\infty} \sin\omega t \int_0^{\infty} f(u)\sin\omega u\,du\,d\omega$$

[antar $a_0 = \frac{1}{T}\int_0^T f(u)\,du \longrightarrow 0$, dvs antar $\int_0^{\infty} f(u)\,du < \infty$]

Dvs: Vilkårlig, ikke-periodisk, $f(t)$ inneholder generelt "alle" frekvenser. Fourier-spektret er <u>kontinuerlig</u>, med fourier-koeffisienter

$$a(\omega) = \int_0^{\infty} f(u)\cos\omega u\,du\,; \qquad b(\omega) = \int_0^{\infty} f(u)\sin\omega u\,du$$

$$f(t) = \frac{1}{\pi}\int_0^{\infty} a(\omega)\cos\omega t\,d\omega + \frac{1}{\pi}\int_0^{\infty} b(\omega)\sin\omega t\,d\omega$$