Fourier $F(q) = \int_{-\infty}^{\infty} f(x) e^{-iqx} dx$

Inverse $f(x) = \frac{1}{2\pi} \int_{-\infty}^{\infty} F(q) e^{iqx} dq$

Transformed of the derivative

$$\mathcal{F}\{f'(x)\}(q) = \int_{-\infty}^{\infty} f'(x) e^{-iqx} dx$$

Using $u = e^{-iqx}$ and $dv = f'(x)dx$, then $du = -iq e^{-iqx} dx$ and $v = f(x)$

$$\int f'(x) e^{-iqx} dx = \left[f(x) e^{-iqx} \right]_{-\infty}^{+\infty} + iq \int f(x) e^{-iqx} dx$$

If the function decays at border (mees that at $\pm\infty$ it is ~ 0)

$$\int f'(x) e^{-iqx} = +iq \int f(x) e^{-iqx} dx$$

$$\mathcal{F}(f'(x))\{q\} = iq\, F(q)$$

Using the inverse

$$f'(x) = \frac{1}{2\pi} \int iq F(q) e^{iqx} dq = FT^{-1}\left[iq F(q) \right]$$