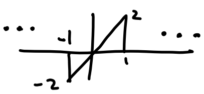
Given: $f(t) = 2t$ for $-1 \le t < 1$, and repeating outside those limits

Find: The middle 3 complex Fourier Series coefficients c_{-1}, c_0, and c_1

Hint: $\int te^{at}dt = \frac{t}{a}e^{at} - \frac{1}{a^2}e^{at}$

Looks like a sawtooth waveform:



$\boxed{c_0 = 0}$ by inspection

$c_1 = \frac{1}{T}\int_{<T>} f(t)\, e^{-jn\omega_0 t}\, dt$, $\quad T = 2 \Rightarrow \omega_0 = \frac{2\pi}{T} = \pi$

$= \frac{1}{2}\int_{-1}^{1} 2t\, e^{-j\pi t}\, dt$

$= \int_{-1}^{1} t\, e^{-j\pi t}\, dt$

$= \frac{t}{-j\pi} e^{-j\pi t} - \frac{1}{(j\pi)^2} e^{-j\pi t} \Big]_{t=-1}^{1}$

$= \frac{j}{\pi}\left[t e^{-j\pi t}\right]_{t=-1}^{1} + \frac{1}{\pi^2}\left[e^{-j\pi t}\right]_{t=-1}^{1}$

$= \frac{j}{\pi}\left[\cancel{e^{-j\pi}}^{-1} - (-1)\cancel{e^{j\pi}}^{-1}\right] + \frac{1}{\pi^2}\left[\cancel{e^{-j\pi}}^{-1} - \cancel{e^{j\pi}}^{-1}\right]$

$= -\frac{j2}{\pi} + \frac{1}{\pi^2}\cdot 0$

$= \boxed{-j0.637 = 0.637\angle -90^\circ}$

$c_{-1} = c_1^* = \boxed{j0.637 = 0.637\angle 90^\circ}$