Aufgabe I.2.3

a) Halbwellensymmetrie und ungerade. Aus diesem Grund reicht es, von 0 bis $\frac{t_p}{4}$ zu integrieren.

$$
\begin{aligned}
b_\mu &= \frac{8}{t_p}\int_0^{\frac{t_p}{6}} \frac{6\hat{i}}{t_p} t \sin(2\pi\mu f_0)\mathrm{d}t + \frac{8}{t_p}\int_{\frac{t_p}{6}}^{\frac{t_p}{4}} \hat{i}\sin(2\pi\mu f_0 t)\mathrm{d}t \\
&= \frac{48\hat{i}}{t_p^2}\left[\frac{\sin(2\pi\mu f_0 t)}{(2\pi\mu f_o t)^2} - t\frac{\cos(2\pi\mu f_0 t)}{2\pi\mu f_o t}\right]_0^{\frac{t_p}{6}} + \frac{8\hat{i}}{t_p 2\pi\mu f_0}\Big[-\cos(2\pi\mu f_0 t)\Big]_{\frac{t_p}{6}}^{\frac{t_p}{4}} \\
&= \frac{12\hat{i}}{\pi^2\mu^2}\Big[\sin(2\pi\mu f_0 t) - t2\pi\mu f_0\cos(2\pi\mu f_0 t)\Big]_0^{\frac{t_p}{6}} + \frac{4\hat{i}}{\pi\mu}\Big[\cos(2\pi\mu f_0 t)\Big]_{\frac{t_p}{6}}^{\frac{t_p}{4}} \\
&= \frac{12\hat{i}}{\pi^2\mu^2}\left(\sin(\frac{\pi\mu}{3}) - \frac{\pi\mu}{3}\cos(\frac{\pi\mu}{3})\right) + \frac{4\hat{i}}{\pi\mu}\left(\cos(\frac{\pi\mu}{3})\right) \\
&= \frac{12\hat{i}}{\pi^2\mu^2}\sin\left(\frac{\pi\mu}{3}\right)
\end{aligned}
$$

b) $B_\mu = |b_\mu| \;\rightarrow\; \frac{12\hat{i}}{\pi^2\mu^2}\left|\sin\left(\frac{\pi\mu}{3}\right)\right|$

$\varphi_\mu = 0$

c) $\underline{c}_0 = a_0 = 0$

$\underline{c}_\mu = -j\frac{b_\mu}{2} = -j\frac{6\hat{i}}{\pi^2\mu^2}\sin\left(\frac{\pi\mu}{3}\right)$

d) $|\underline{c}_\mu| = \frac{6\hat{i}}{\pi^2\mu^2}\left|\sin\left(\frac{\pi\mu}{3}\right)\right| e^{-j\pi}$

