Avtokorelacija periodičnih signalov

$$\varphi_{ii}[\tau] = \frac{1}{T} \int_{t_0}^{t_0+T} f_i[t] * f_i[t + \tau] \, dt$$
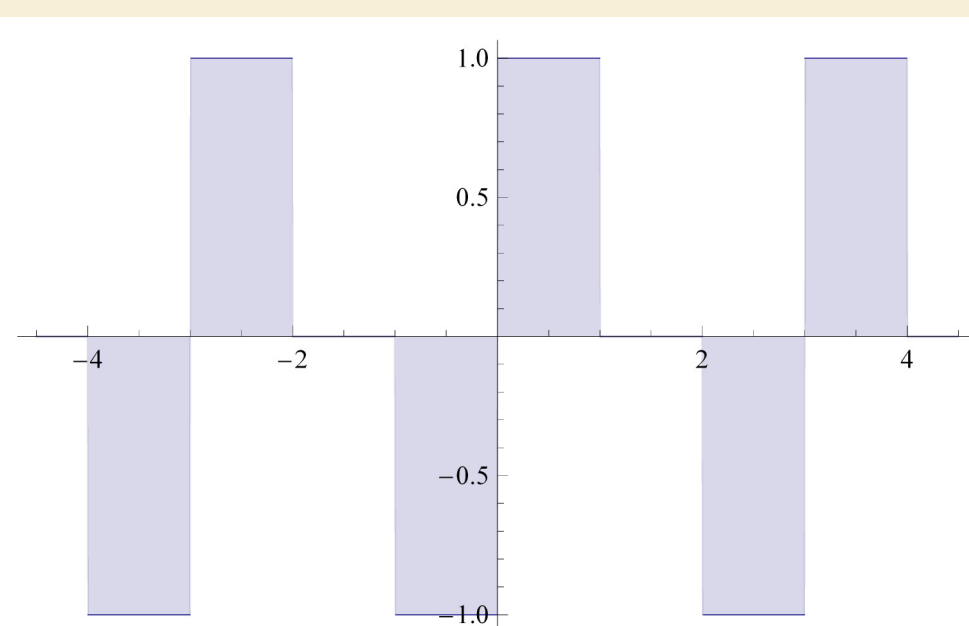
Naloga 1:

Naloga:

Za periodični signal $f_1(t)$ določi avtokorelacijo in skiciraj nejen potek.

□ **Signal:**

```
Plot[f₁[t] + f₁[t + 3] + f₁[t - 3], {t, -4.5, 4.5}, PlotRange → All, Filling → Axis]
```


$$f_1[t\_] := \begin{cases} -1 & -1 \leq t \leq 0 \\ 1 & 0 \leq t \leq 1 \\ 0 & 1 \leq t < 2 \\ 0 & \text{True} \end{cases}$$

□ **Rešitev**

Zaradi periodičnosti avtokorelacije računamo za premike samo ene periode.

```
T = 3;
```

```
0 ≤ τ ≤ 1
```

$$\varphi_{11} = \frac{1}{3} \left(\int_{-1}^{-\tau} (-1) * (-1) \, dt + \int_{-\tau}^{0} (-1) * (1) \, dt + \int_{0}^{1-\tau} (1) * (1) \, dt \right)$$

$$\frac{1}{3} (2 - 3\tau)$$

```
1 ≤ τ ≤ 2
```

$$\varphi_{11} = \frac{1}{3} \left(\int_{-1-\tau}^{-2} (1) * (-1) \, dt + \int_{-2}^{-\tau} (0) * (-1) \, dt + \int_{-\tau}^{-1} (0) * (1) \, dt + \int_{-1}^{1-\tau} (-1) * (1) \, dt \right)$$

$$-\frac{1}{3}$$

$$2 \leq \tau \leq 3$$

$$\varphi_{11} = \frac{1}{3} \left(\int_{-1-\tau}^{-3} (-1) * (-1) \, dt + \int_{-3}^{-\tau} (1) * (-1) \, dt + \int_{-\tau}^{-2} (1) * (1) \, dt + \int_{-2}^{1-\tau} (0) * (1) \, dt \right)$$

$$\frac{1}{3} \, (-7 + 3 \, \tau)$$

Narišemo. *Avtokorelacija mora biti zvezna in periodična funkcija!!!*

$$\varphi_{11}[\tau\_] := \begin{cases} \frac{1}{3} * (2 - 3 \, \tau) & 0 \leq \tau \leq 1 \\ -\frac{1}{3} & 1 \leq \tau \leq 2 \\ \frac{1}{3} * (-7 + 3 \, \tau) & 2 \leq \tau \leq 3 \\ 0 & \text{True} \end{cases}$$

```
Plot[φ₁₁[τ] + φ₁₁[τ + 3] + φ₁₁[τ - 3], {τ, -4.5, 4.5}]
```