

# Signals exercise 1

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January 2020

## 1 Tasks from the book

### 2 task 2.6

$$x(t) = 2t, x(-t) = 2t \implies \text{even} \quad (1)$$

$$x(t) = 2t, x(-t) = 2t \implies \text{even} \quad (2)$$

$$x(t) = \exp -|4t|, x(-t) = \exp -|4t| \implies \text{even} \quad (3)$$

$$x(t) = 4 \cos 6t = x(-t) \implies \text{even} \quad (4)$$

$$x(t) = u(-t) - u(t) = \begin{cases} -1, & x \leq 1 \\ 1 & x \geq 1 \end{cases} \implies \text{odd} \quad (5)$$

$$x(t) = \sin 6t - \pi/2 \implies \text{odd} \quad (6)$$

$$x(t) = u(-t) + u(t) = 1 \implies \text{even} \quad (7)$$

### 3 task 2.17

$$\int_{-\infty}^{\infty} \delta(bt - a) \cos^2(t - c) dt \quad (8)$$

$$u = bt - a \implies dt = \frac{du}{b} \quad (9)$$

### 4 2.17

$$\int_{-\infty}^{\infty} \frac{\delta(u) \cos^2(\frac{u+a}{b} - c)}{b} du = \frac{\cos^2(\frac{a}{b} - c)}{b} \quad (10)$$

a-ii.pdf

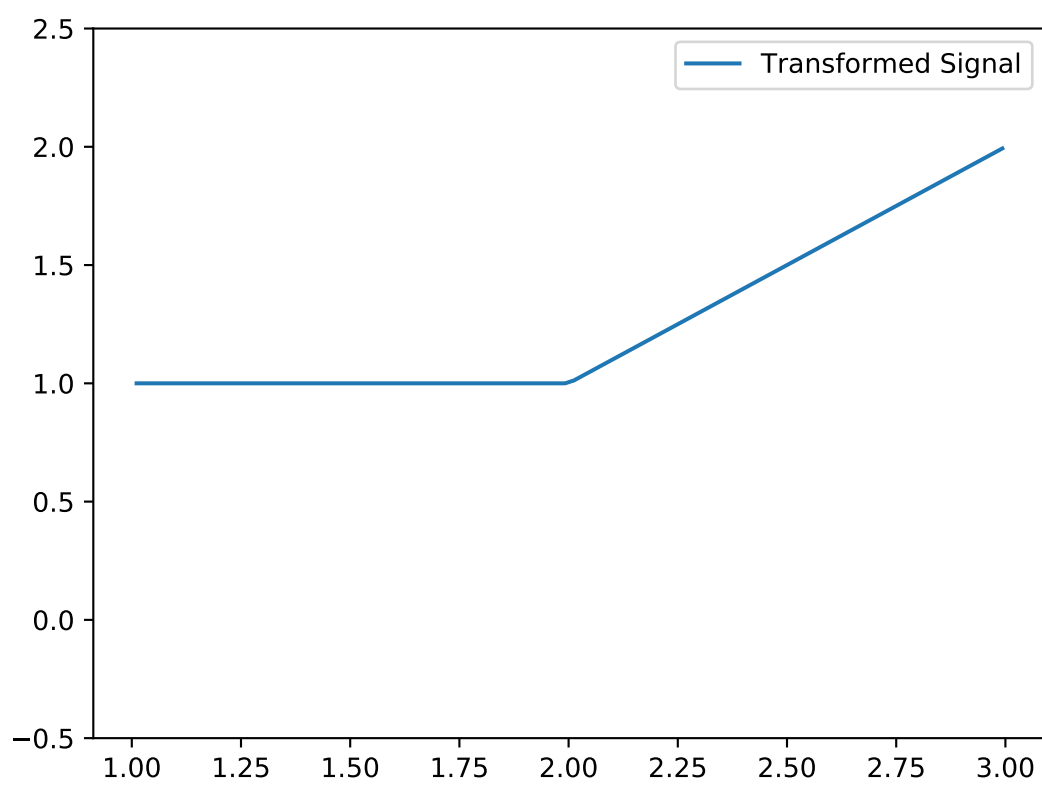


Figure 1: Transformation of the signal in task 2.1 a-ii

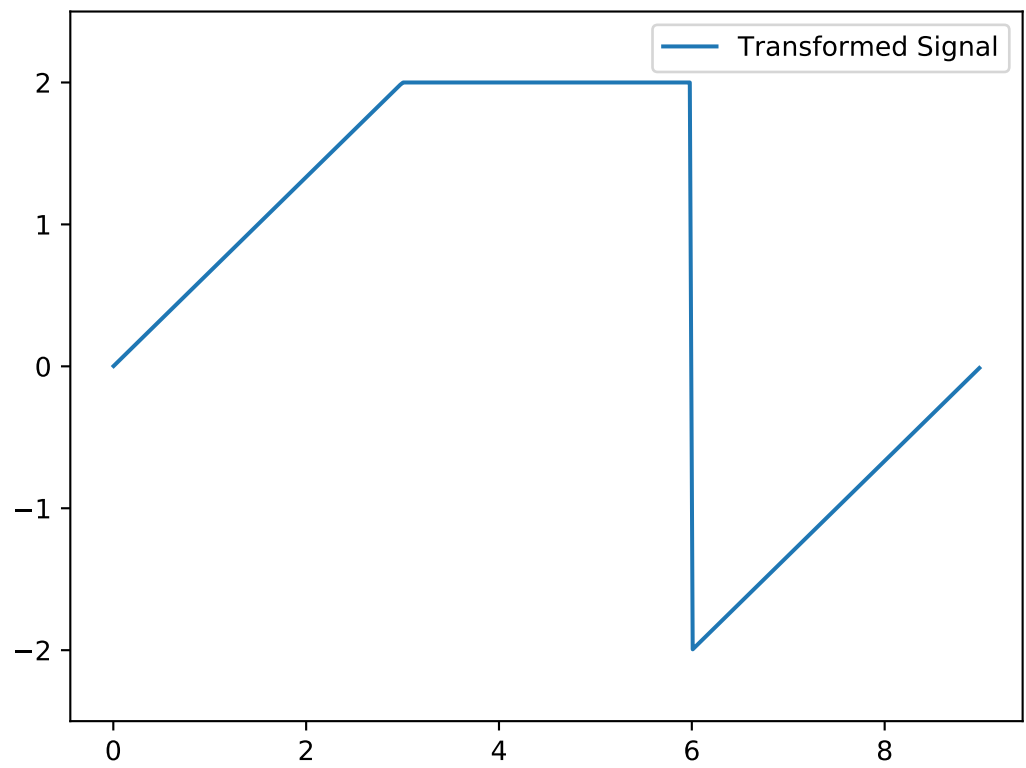


Figure 2: Transformation of the signal in task 2.1 b-iv

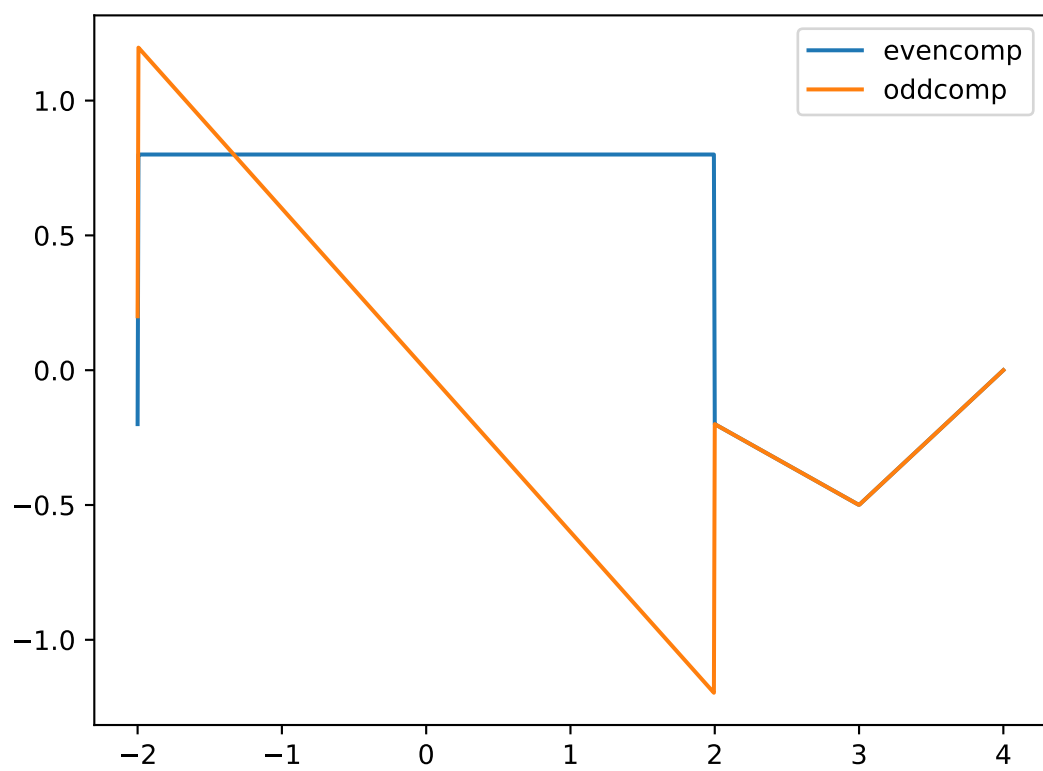


Figure 3: Odd-even decomposition of the signal in 2.5

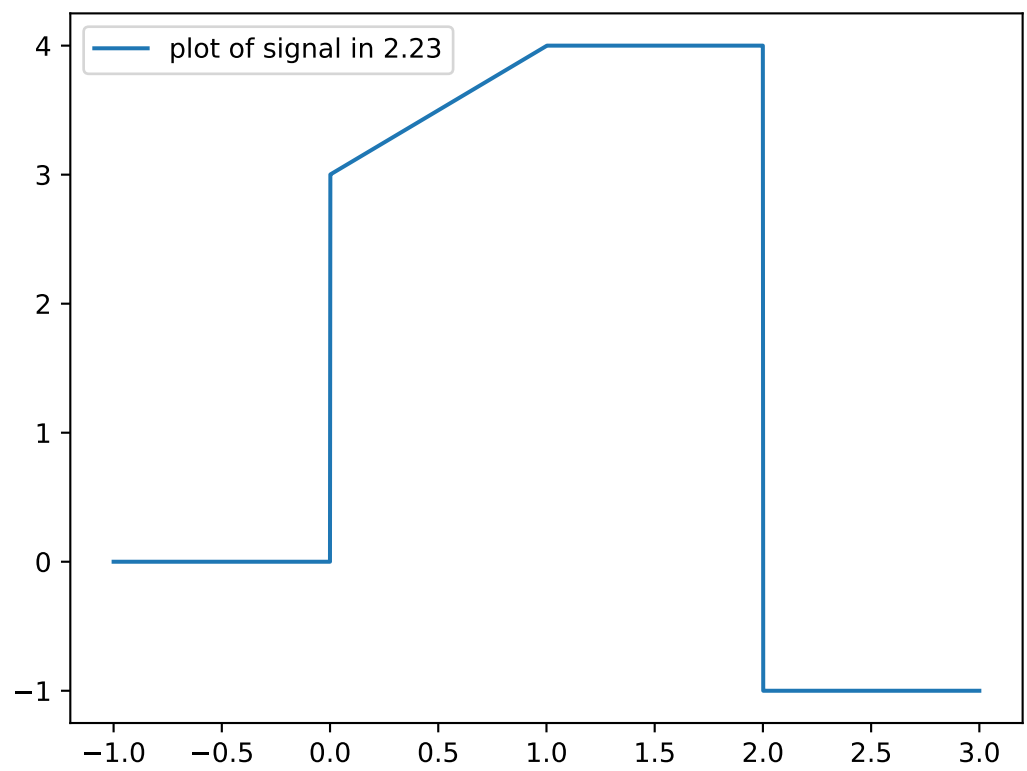


Figure 4: Signal from task 2.23

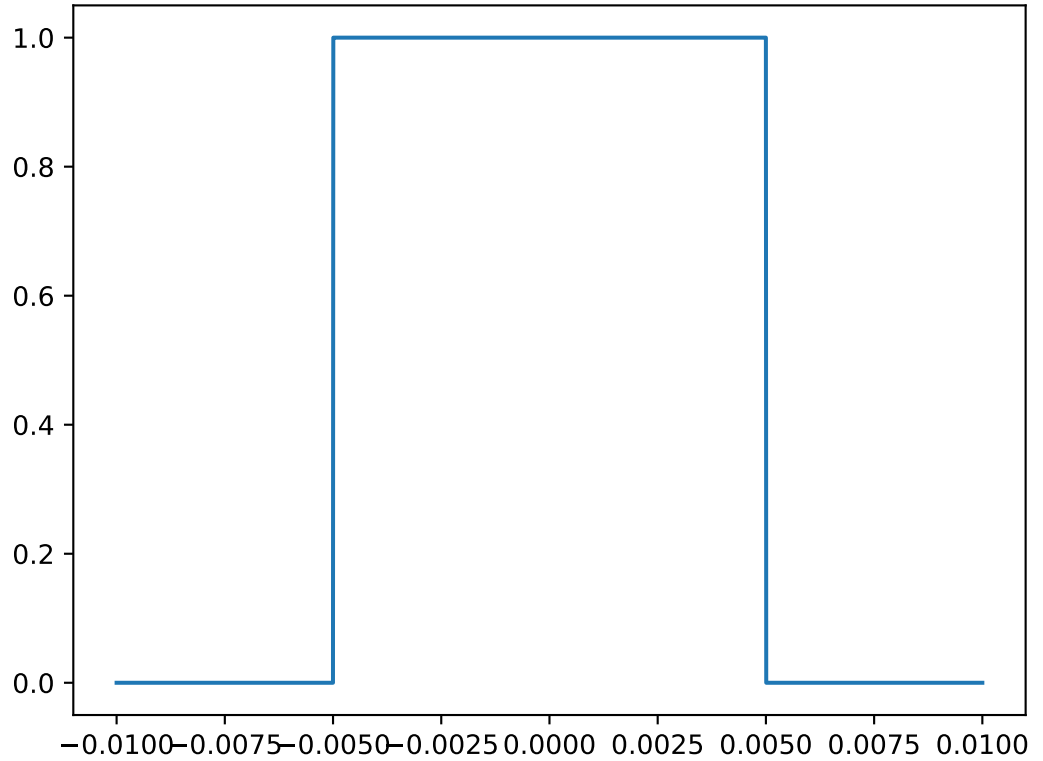


Figure 5: a rectangular pulse

## 5 Task 2.26 a

$$f(t) = 3*t*u(t)*u(-t+1) + 3*u(t-1)*u(-t+2) + (-3+9)*u(t-2)*u(-t+3) \quad (11)$$

task 2.26 b follows trivially from the way the equation for the trapezoidal signal is written

task 2.26 c) we simply define an additional condition

$$f(t) = 3*t*u(t)*u(-t+1) + 3*u(t-1)*u(-t+2) + (-3+9)*u(t-2)*u(-t+3), f(t+3) = f(t) \quad (12)$$

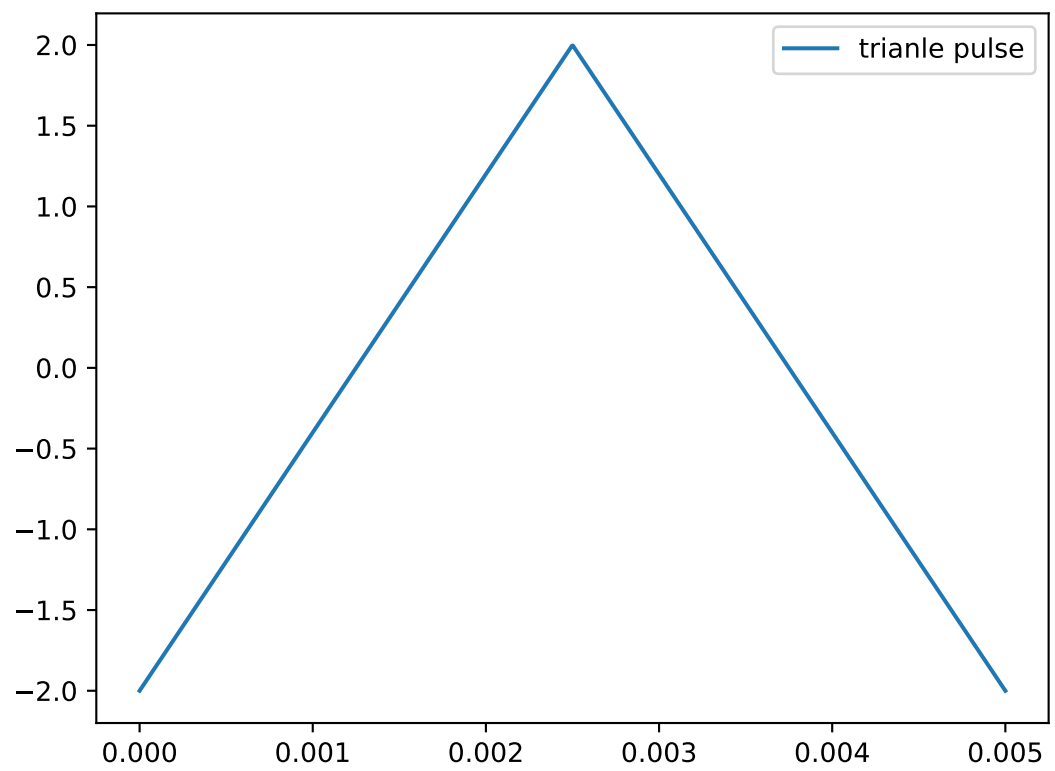


Figure 6: a triangular pulse

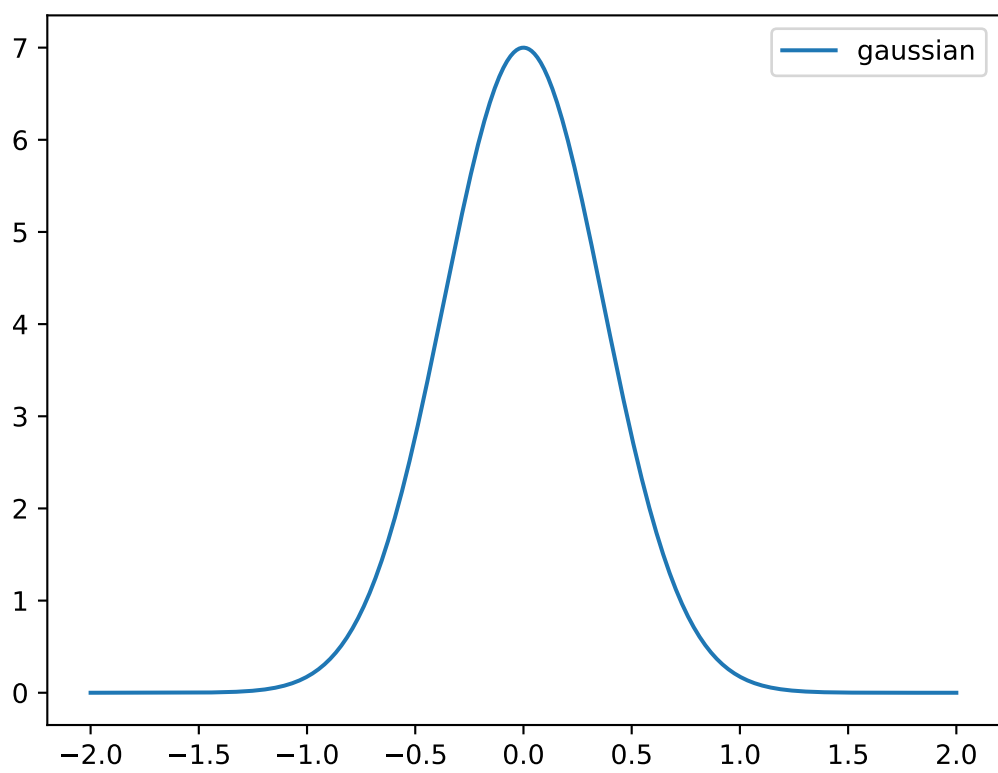


Figure 7: a gaussian pulse



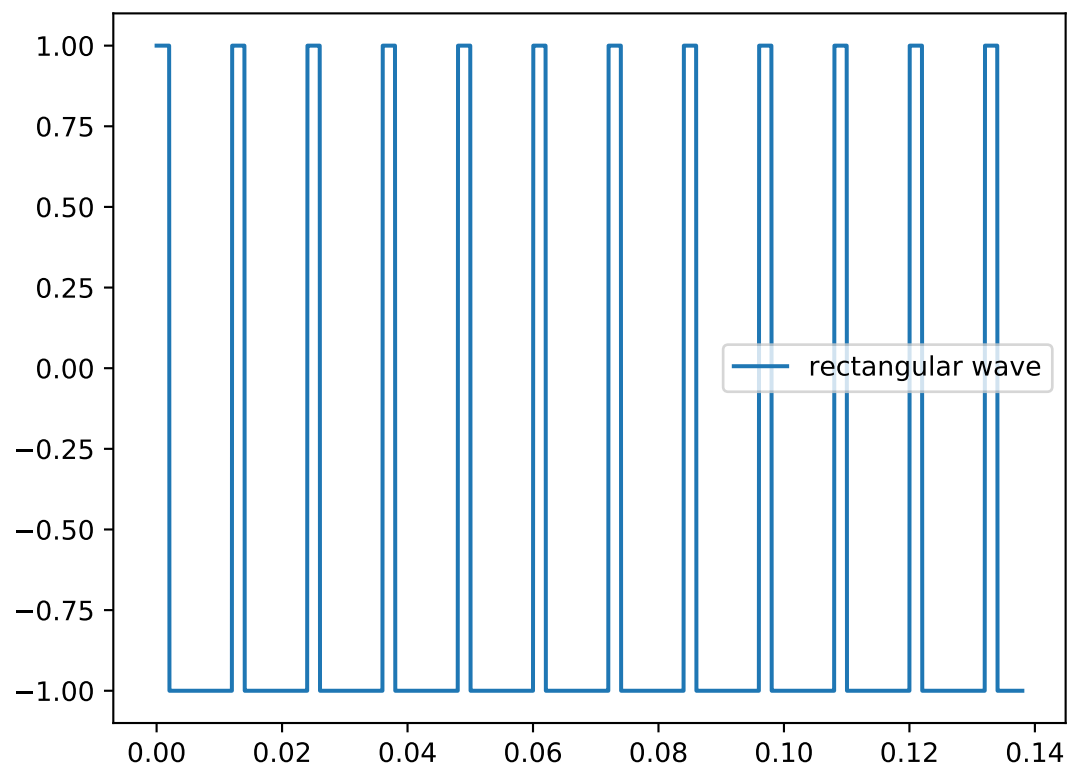


Figure 8: a series of rectangular waves