

Instruction: DO NOT copy homework from your classmates or lend it to others. Anyone who violates this regulation will be given -10 for the homework.

1. For a signal $f(t)$ shown in Fig. 1,

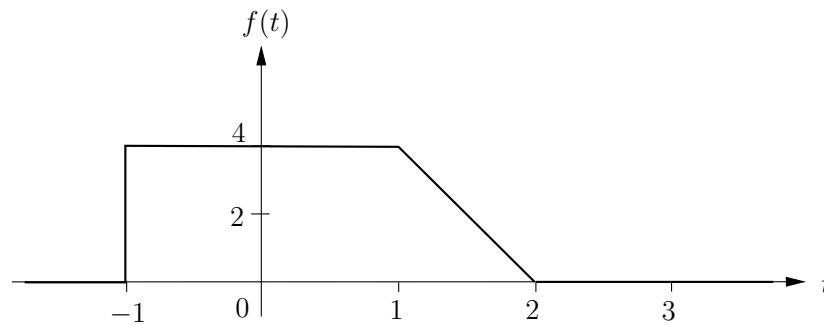


Figure 1: a signal $f(t)$ for the question 3

- (a) Sketch signals $f_1(t) = f(2t - 3)$ (5 points)
(b) Sketch signals $f_2(t) = f(2 - t)$ (5 points)
2. Evaluate the following integrals: (1 point for each)

(a) $\int_{-\infty}^{\infty} \delta(\tau) f(t - \tau) d\tau$

(d) $\int_{-\infty}^{\infty} \delta(t + 3) e^{-t} dt$

(b) $\int_{-\infty}^{\infty} f(\tau) \delta(t - \tau) d\tau$

(e) $\int_{-\infty}^{\infty} (t^3 + 4) \delta(1 - t) dt$

(c) $\int_{-\infty}^{\infty} \delta(t) e^{-j\omega t} dt$

(f) $\int_{-\infty}^{\infty} e^{x-1} \cos \left[\frac{\pi}{2} (x - 5) \right] \delta(x - 3) dx$

Hint: $\delta(x)$ is located at $x = 0$. For example, $\delta(1 - t)$ is located at $1 - t = 0$, and so on.

3. For a signal $f(t)$ shown in Fig. 1, Show a mathematic equation that describes the signal $f(t)$ in terms of unit step function $\mathbb{1}(t)$. (5 points)