CG2023 ASSIGNMENT 1 (Temporal Operations on Signals)

1. The signal $x(t)$ shown in Figure1 may be expressed as

$$x(t) = A\,\text{tri}\left(\frac{t}{\alpha}\right) + B\,\text{rect}\left(\frac{t-b}{\beta}\right) + C\,\text{rect}\left(\frac{t-c}{\chi}\right)$$

Find the values of A, α, B, b, β, C, c and χ.

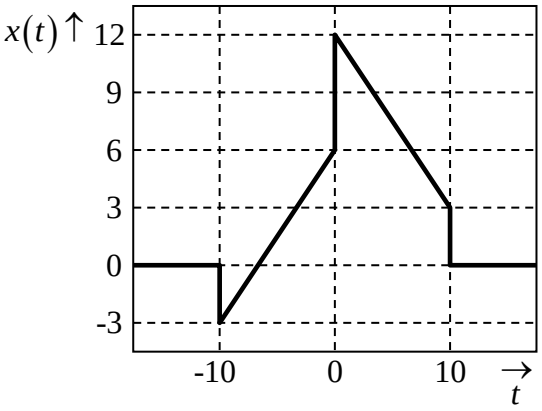

Figure 1

2. Draw a labeled sketch of each of the following signals:

(a) $x(t) = 2\cos(\pi t)u(t+4)u(2-t)$.

(b) $x(t) = \text{rect}(0.25t) + 2\text{tri}(0.5t) - \text{tri}(t)$

3. Given $x(t) = -3 + j4$ and $y(t) = \sqrt{2}e^{j0.25\pi}$.

(a) Find $|x(t) - y(t)|$ and $\angle[x(t) - y(t)]$.

(b) Express $x(t)y(t)$ and $\dfrac{x(t)}{y(t)}$ in rectangular form.

4. Given $w(t)$ as shown in Figure 4. Draw a labeled sketch of $z(t) = 5w\left(-\frac{t}{2} - 4\right)$.

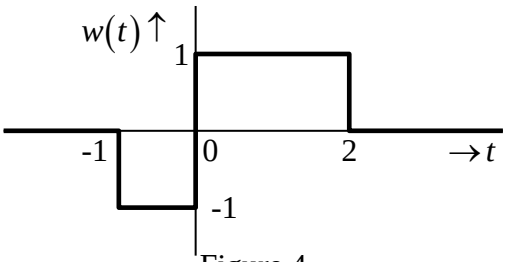

Figure 4

5. Sketches of $x(t)$ and $y(t)$ are shown in Figures 5(a) and 5(b), respectively. Express $y(t)$ in terms of $x(t)$.

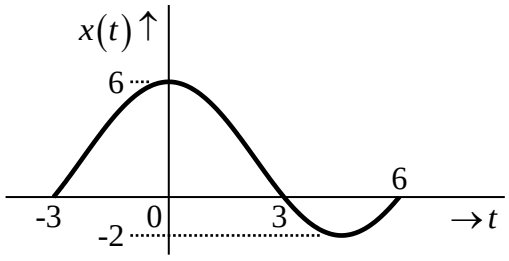

Figure 5(a)

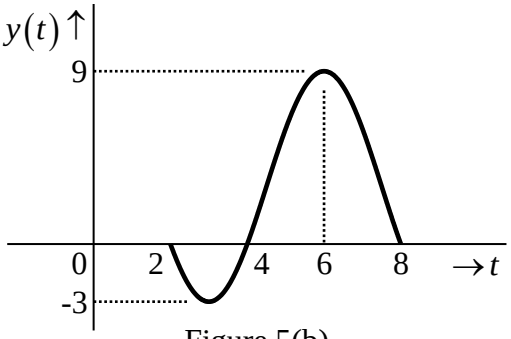

Figure 5(b)

6. Given $y(t) = 3\,\text{rect}\left(\frac{t}{8}\right) \ast \left[2\,\text{tri}\left(\frac{t}{12}\right) \times \sum_n \delta(t - 6n)\right]$ where '$\ast$' denotes convolution. Express $y(t)$ in terms of "rect" functions. Hence, find $\int_{-\infty}^{\infty} y(t)\,dt$.