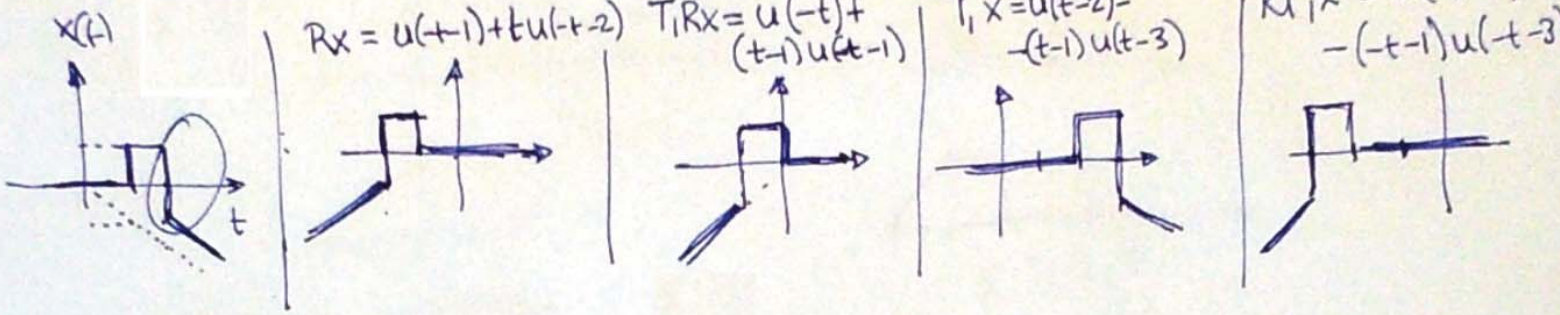
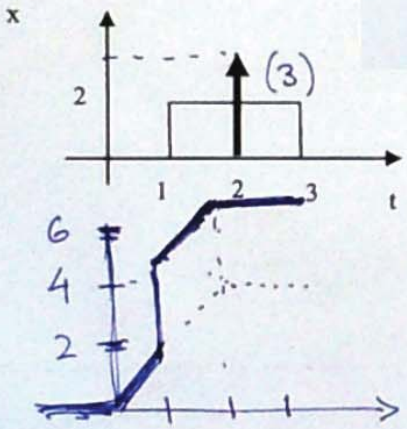
EEE 203, TEST 1 **NAME:** SOLUTIONS

Problem 1.
Consider the signal $x(t) = u(t-1) - tu(t-2)$. Compute and sketch the signals $T_1R[x], RT_1[x]$, where R denotes the reflection operation and T_{t0} denotes shift delay operation by t0.



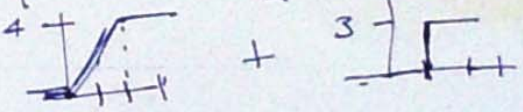
Problem 2.
Describe the following signal in terms of elementary functions (δ, u, r, ...) and compute its integral $y(t) = \int_{-\infty}^{t} x(\tau+1)d\tau$.



$$x(t) = 2(u(t-1) - u(t-3)) + 3\delta(t-2)$$

$$\int_{-\infty}^{t} x(\tau+1)\,d\tau = \int_{-\infty}^{t} 2[u(\tau) - u(\tau-2)]\,d\tau + \int_{-\infty}^{t} 3\delta(\tau-1)\,d\tau$$

$$= 2[r(t) - r(t-2)] + 3u(t-1)$$



Problem 3.
Compute the convolution $h*x$ when $x(t) = u(t-1)$, $h(t) = u(t-1) - u(t-3)$.
($u(t)$ is the unit step)

$$h*x = \int_{-\infty}^{\infty} [u(t-\tau-1) - u(t-\tau-3)]\,u(\tau-1)\,d\tau$$

$$= \int_{1}^{t-1} 1 \cdot d\tau - \int_{1}^{t-3} 1\,d\tau = (t-2)u(t-2) - (t-4)u(t-4)$$

$$= r(t-2) - r(t-4)$$