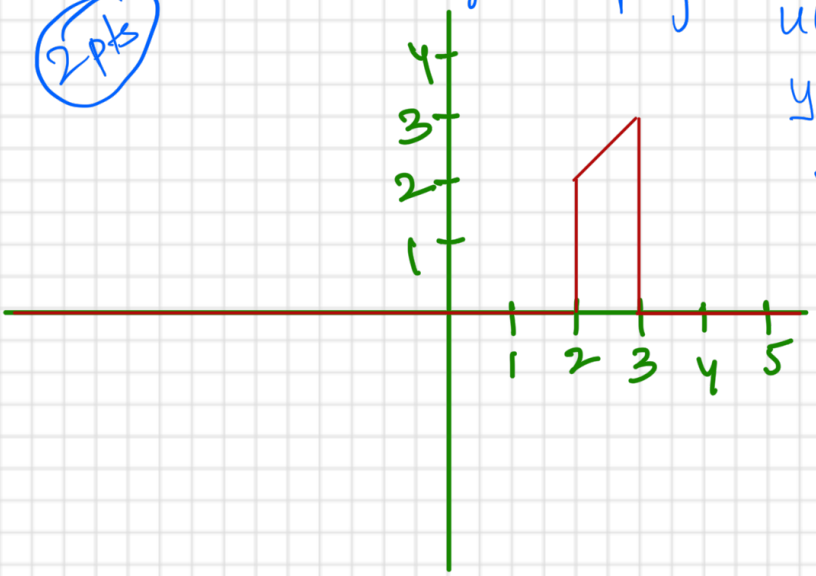
CPE381 Classwork06 FALL 2024 UAH
Instructor: Rahul Bhadani 09/11/2024 | Total: 20pts

① Write the compact from for the following signal shown below using ramp function $r(t)$ and unit-step function $u(t)$. (2pts)



You may need to apply appropriate transformation to ramp or unit-step signal.

② Check if the signal $x(t) = e^{-at}u(t)$, $a>0$ is an energy signal. (4pts)

Note: a signal is energy signal if its energy is finite.

③ Calculate the power of the sign $x(t) = A\cos(\Omega_0 t + \theta)$ (5pts)

Hint: first state the time period of $x(t)$.

Power of the signal $P = \frac{1}{T}\int_0^T |x(t)|^2 dt$

$$\left[P = \int_{-T/2}^{T/2} |x(t)|^2 dt = \int_0^T |x(t)|^2 dt\right]$$

④ Evaluate $\int_{-1}^{1} (3t^2+1)\,\delta(t)\,dt$

(2 pts)

⑤ Input $x(t) = u(t)$

Impulse response $h(t) = e^{-at}u(t)$, $a>0$.

(5 pts)

Compute $y(t)$.

Use the convolution integration

$$y(t) = x(t) * h(t) = \int_{-\infty}^{\infty} x(\tau)h(t-\tau)\,d\tau$$

Note that $x(\tau)$ and $h(t-\tau)$ overlap between $\tau=0$ and $\tau=t$.

Hint: sketch $x(t)$ and $h(t)$, and consider various shifted version of $h(t)$.

(6) (2pts) Is a system described by input-output relationship

$$y(t) = x(at)$$

time-invariant?