ECE102, Fall 2020

Signals & Systems

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### 1. Complex Exponential

(a) Let 
$$z_1 = 16e^{-j\frac{2\pi}{3}}$$
 and  $z_2 = 4 - j4\sqrt{3}$ 

- i. Express  $\frac{z_1}{z_2}$  in cartesian form ii. Express  $\frac{z_1}{z_2}$  in polar form
- (b) Show that

$$1 - e^{j\alpha} = 2\sin(\frac{\alpha}{2})e^{j\left[\frac{(\alpha - \pi)}{2}\right]}$$

## 2. Energy and Power of Signals

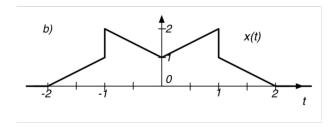
Find the energy and power of

$$y(t) = e^{-ct}$$

where c = a + jb. Note: a and b are real valued

### 3. Expression for Signals

Write the signal as a combination (sums or products) of scaled and shifted unit triangles  $\Delta(t)$  and unit rectangles rect(t).

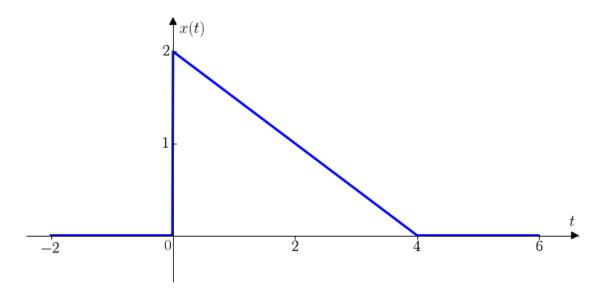


#### 4. Elementary signals.

(a) Consider the signal x(t) shown below. Sketch the following:

i. 
$$y(t) = x(t) (u(t-1) - u(2t-5))$$

ii. 
$$y(t) = \int_{-\infty}^{t} \delta(\tau - 2)x(\tau)d\tau$$



# (b) Evaluate the integral:

$$y(t) = \int_{-\infty}^{\infty} f(\tau)\delta(t-\tau)\delta(t-2)d\tau$$