

Assignment #1

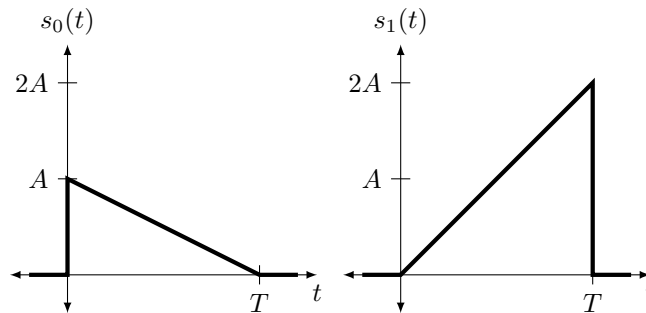
Due on Wednesday, February 8, 2023

1. For the sequence of bits 01011, sketch the transmitted analogue signal if each of the following line codes are used:

- (a) unipolar NRZ
- (b) polar NRZ
- (c) unipolar RZ
- (d) bipolar RZ
- (e) Manchester coding

2. Suppose the signals $s_0(t)$ and $s_1(t)$ shown below:

- (a) Write mathematical expressions for $s_0(t)$ and $s_1(t)$.
- (b) Sketch the sum $v(t) = s_0(t) + s_1(t)$.
- (c) Sketch the product $v(t) = s_0(t)s_1(t)$.
- (d) Sketch the convolution $v(t) = s_0(t) \otimes s_1(t)$.
- (e) Find the inner product $s_{01} = \langle s_0(t), s_1(t) \rangle$.



3. For the signals $s_0(t)$, $s_1(t)$, and $s_2(t)$ shown below:

- (a) Use the Gram-Schmidt orthogonalization procedure to find a set of basis signals. Sketch the basis signals.
- (b) Express $s_0(t)$, $s_1(t)$, and $s_2(t)$ as linear combinations of the basis signals.
- (c) Show $s_0(t)$, $s_1(t)$, and $s_2(t)$ on a signal space diagram.
- (d) What is the average transmitted energy, if each signal is equally likely to be transmitted?

