

1. Pulse shaping

Download MATLAB script `line_coding.m` from Canvas. The script plots waveforms associated with different pulse shaping schemes. Run the script using the last four digits of your student ID number. Attach the resulting figure to your solution.

2. Polar Manchester signaling

A binary source outputs bits at a rate of 10 Mbps. You are asked to sketch carefully the power spectral density of polar Manchester signaling with a mapper amplitude of 1 mV and a unit-energy pulse.

3. Let  $X$  be a Gaussian random variable of mean  $\mu_X = 2$  and variance  $\sigma_X^2 = 3$ . Find an expression for each of the following probabilities, in terms of the Gaussian  $Q$ -function<sup>1</sup>, and evaluate it numerically.

(a)  $P[X \leq 0]$

(b)  $P[X > 3]$

(c)  $P[0 < X \leq 2]$

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<sup>1</sup> $Q(x) = \int_x^\infty \frac{1}{\sqrt{2\pi}} e^{-u^2/2} du$ , or, in terms of the complementary error function,  $Q(x) = (1/2) \operatorname{erfc}(x/\sqrt{2})$ .

In `matlab` you can use `qfunc(x)`.