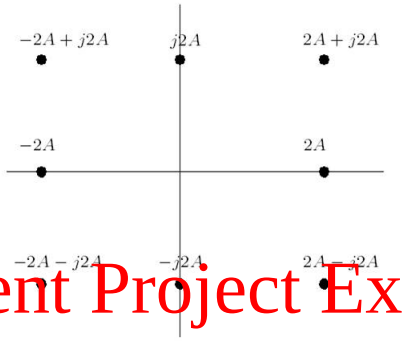
Homework Assignment 10

Due: No need to submit

Problem 1. In an M-ary ASK digital communication system, the channel has bandwidth 1400 Hz. Select a symbol rate and a signal constellation size to achieve a 9600 bit per second error-free signal transmission.

Problem 2.

(a) Find the average transmit energy and minimum distance of the constellation shown in the following figure:



(b) Find a better constellation with 8 elements, and justify your answer.
Hint: try to minimize the average symbol energy without sacrificing/decreasing the minimum distance.

Problem 3. In a digital transmission system. The signal constellation is $\mathcal{A} = \{-1, 1\}$. The received signal is

$$y = a + n,$$

where a is the transmitted signal and n is the noise.

(a) The minimum distance rule is used for detection. What is the decision rule?

(b) If n is Gaussian with zero-mean and unit variance, what is the probability of error using the decision rule in (a) when $a = 1$?