EE5585: Homework 3

All problems carry equal points. Due date: April 23 (before class starts)

(1) Consider the following sampling matrix Φ:

$$\begin{bmatrix} 1 & 0 & 0.5 \\ -2 & 1 & 1 \end{bmatrix}$$

We observe samples of an 1-sparse vector x:

$$y = \Phi x = \begin{bmatrix} 0 \\ 5 \end{bmatrix}.$$

Find out x.

Next, suppose we observe:

$$z = \Phi x = \begin{bmatrix} 10.1 \\ -20.1 \end{bmatrix}.$$

For a general vector x. Find out x using ℓ_1-minimization (basis pursuit).

(2) Following table shows height-weight data of 12 monkeys:

Height	Weight
18	29.5
28	39.2
36	54.5
25	36.0
17	25.0
31	43.8
21	30.4
35	56.1
24	36.0
22	29.9
18	26.9
32	48.2

Find out an orthonormal transform matrix to compress this data. Suppose you compress this two-dimensional data to one-dimensional. Show the data-compression procedure. What is the average error/distortion?