Digital Signal Processing - Assignment 5

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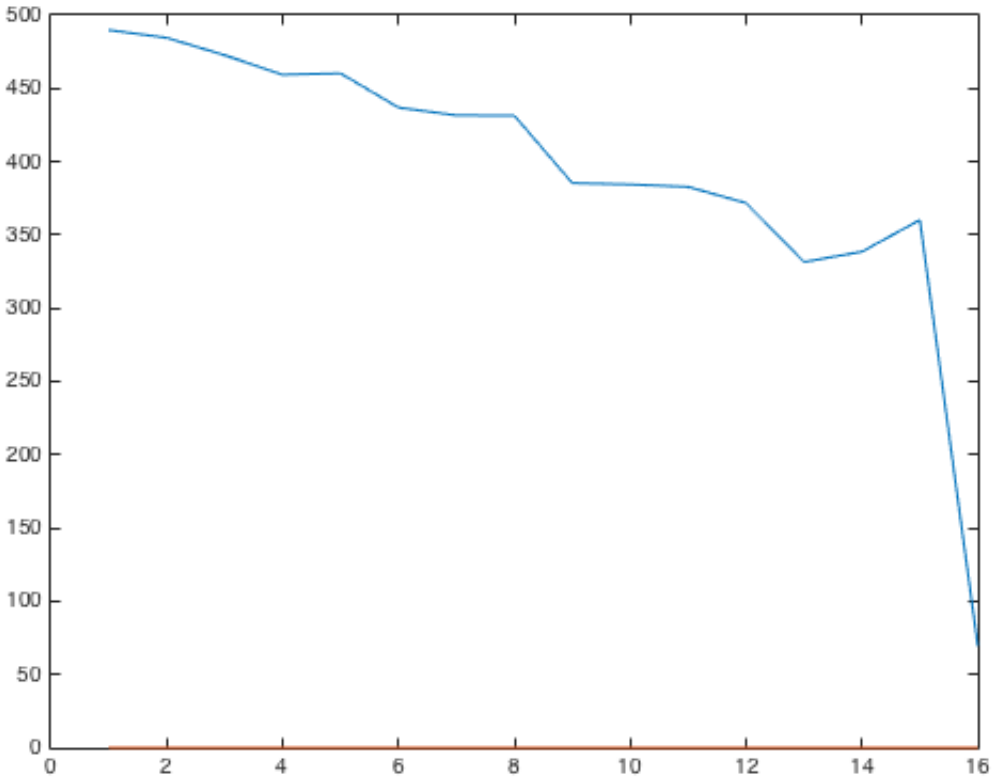
Exercise 1

1.1

See included files hw5.m, PCA.m, and MSE.m.

1.2



Exercise 2

If z_1 and z_2 are independent, the covariance matrix is:

$$\begin{bmatrix} E[(z_1-\mu_1)^2] & E[(z_1-\mu_1)(z_2-\mu_2)]^2 \\ E[(z_1-\mu_1)(z_2-\mu_2)]^2 & E[(z_2-\mu_2)^2] \end{bmatrix}$$

To show that the matrix is diagonal, we need to show that $E[(z_1-\mu_1)(z_2-\mu_2)]^2 = 0$.

$$\begin{aligned} E[(z_1-\mu_1)(z_2-\mu_2)] &= E[z_1z_2 - z_1\mu_2 - z_2\mu_1 + \mu_1\mu_2)] \\ &= E[z_1z_2] - E[z_1]E[z_2] - E[z_1]E[z_2] + E[z_1]E[z_2] \\ &= E[z_1z_2] - E[z_1]E[z_2] \\ &= 0 \end{aligned}$$

The last step is true since z_1 and z_2 are independent.