

## Class: Geophysical Inversion Theory

### Homework #1

**A.** Suppose that you determine the masses of 100 objects by weighing the first, then weighing the first and second together, and then weighing the rest in triplets: the first, second, and third; the second, third, and fourth; and so forth. (A) Identify the data and model parameters in this problem. How many parameters of each are there? (B) Write down the matrix  $\mathbf{G}$  in the form  $\mathbf{d} = \mathbf{G}\mathbf{m}$  that relates the data to the model parameters. (C) How many elements does the matrix has and what percentage of elements are zero, i.e. how sparse is  $\mathbf{G}$ ?

**B.** Let the data  $\mathbf{d}$  be the running average of the model parameters,  $\mathbf{m}$ , computed by averaging groups of three neighboring points; that is,  $d_i = (m_{i-1} + m_i + m_{i+1})/3$ . (A) What is the matrix  $\mathbf{G}$  in the equation  $\mathbf{d} = \mathbf{G}\mathbf{m}$  in this case? (B) What problems arise at the top and bottom rows of the matrix and how can you deal with them?