

NORTHERN ILLINOIS UNIVERSITY

PHYSICS DEPARTMENT

Physics 374 – Junior Physics Lab

Spring 2021

Problem Set #5

Problem Set Due: Tues., March 16, 2021

Read Bevington: Chapter 6

Chapter 6:

1. Using the expression for χ^2 , Eq. 6.9:

$$\chi^2 = \sum \left[\frac{y_i - y(x_i)}{\sigma_i} \right]^2 = \sum \left[\frac{1}{\sigma_i} (y_i - a - bx_i) \right]^2 \quad (6.9)$$

find the expressions that give the minimum in χ^2 (Eq. 6.10 for a and b), show that they can be arranged in the form given in Eq. 6.11, and show how to set up the solutions to a and b given in Eq. 6.12. If you use Cramer's rule (do a Google search if you have forgotten this rule), explain the rule when you derive Eq. 6.12.

2. Explain where Eq. 6.19 comes from:

$$\sigma_z^2 = \sum \left[\sigma_i^2 \left(\frac{\partial z}{\partial y_i} \right)^2 \right] \quad (6.19)$$

and show how this leads to the uncertainties give in Eqs. 6.21 and 6.22 (show all the steps in fine detail).