Physics 441 Assignments

1. Curve Fitting Part I – Linear Fit – No Uncertainties

Write a program to fit the following data using a linear least-squares fitting algorithm. There are no uncertainties on the data points themselves. Your should calculate the fit parameters, as well as the uncertainties on the fit parameters.

X Y

1 1.6711

2 2.00994

3 2.26241

4 2.18851

5 2.33006

6 2.42660

7 2.48424

8 2.63729

9 2.77163

10 2.89610

11 2.89083

12 3.08081

13 3.05305

14 3.24079

15 3.36212

1. Curve Fitting Part II – Linear Fit – Uncertainties on the Data

Using the data from part I, assign an uncertainty (say, on the order of 0.1), Δy, to each data point. Start with having equal uncertainties on each data point. Modify the program from part I to take into account the uncertainties. You should find that the fit parameters will not change in value, but the uncertainties on the fit parameters will now be somewhat larger.

Next, assign non-equal uncertainties. Now, you should find that both the fit parameters and the uncertainties on the fit parameters should change should both change.

1. Curve Fitting Part III – Higher Order Fits

Modify the code that you wrote for part II to be able to fit the data with a polynomial of arbitrary order. Include uncertainties on the data points, as well.

1. Random Number Generation

Write a program that generates and plots the following random number distributions:

A uniform distribution on the interval [0,1]

A triangular distribution on the interval [0,2]

A decaying exponential distribution with a decay constant of 1

A Gaussian distribution with a mean of zero and a sigma of 1

A Gaussian distribution with a mean of 1 and sigma of 0.3