Homework 2

- **Read Chapters 5-10 of Fortran 95/2003 (Chapman)**

- **Begin reading Chap. 1-2 of Introduction to Parallel Computing by Grama et al. if you have the book.**

- **Due Thursday, Oct. 8:**
  - Exercises below and plot the results
  - Provide listing of code
  - Provide output of slope and intercept
  - Provide plot of results

Problem (Chapman)

6-27 Linear Least-Squares Fit Develop a subroutine that will calculate slope m and intercept b of the least-squares line that best fits an input data set. The input data points (x,y) will be passed to the subroutine in two input arrays, X and Y. The equations describing the slope and intercept of the least-squares line are

$$y = mx + b \qquad (4\text{-}5)$$

$$m = \frac{(\Sigma xy) - (\Sigma x)\bar{y}}{(\Sigma x^2) - (\Sigma x)\bar{x}} \qquad (4\text{-}6)$$

and

$$b = \bar{y} - m\bar{x} \qquad (4\text{-}7)$$

where

Σx is the sum of the x values.
Σx^2 is the sum of the squares of the x values.
Σxy is the sum of the products of the corresponding x and y values.
$\bar{x}$ is the mean (average) of the x values.
$\bar{y}$ is the mean (average) of the y values.

Test your routine using a test driver program and the following 20-point input data set:

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No.	x	y	No.	x	y
			Sample data to test least-squares fit routine		

Sample data to test least-squares fit routine

No.	x	y	No.	x	y
1	−4.91	−8.18	11	−0.94	0.21
2	−3.84	−7.49	12	0.59	1.73
3	−2.41	−7.11	13	0.69	3.96
4	−2.62	−6.15	14	3.04	4.26
5	−3.78	−5.62	15	1.01	5.75
6	−0.52	−3.30	16	3.60	6.67
7	−1.83	−2.05	17	4.53	7.70
8	−2.01	−2.83	18	5.13	7.31
9	0.28	−1.16	19	4.43	9.05
10	1.08	0.52	20	4.12	10.95

6–28 Correlation Coefficient of Least-Squares Fit Develop a subroutine that will calculate both the slope m and intercept b of the least-squares line that best fits an input data set and also calculate the correlation coefficient of the fit. The input data points (x, y) will be passed to the subroutine in two input arrays X and Y. The equations describing the slope and intercept of the least-squares line are given in the previous problem, and the equation for the correlation coefficient is

$$r = \frac{n(\Sigma xy) - (\Sigma x)(\Sigma y)}{\sqrt{[(n\Sigma x^2) - (\Sigma x)^2][(n\Sigma y^2) - (\Sigma y)^2]}} \tag{4–10}$$

where

Σx is the sum of the x values.
Σy is the sum of the y values.
Σx^2 is the sum of the squares of the x values.
Σy^2 is the sum of the squares of the y values.
Σxy is the sum of the products of the corresponding x and y values.
n is the number of points included in the fit.

Test your routine using a test driver program and the 20-point input data set given in the preceding problem.