

Name: _____

- (15 pts) Write a Fortran subroutine to calculate $C = A - B$ where A , B , and C are double precision $n \times n$ matrices.
- (15 pts) What are x_1 , x_2 , and x_3 in Newton's method for finding the solution to $f(x) = x^2 \cos(2\pi x) = 0$ using starting value $x_0 = 2$? What is $f(x_3)$?
- (15 pts) What are the smallest, largest, and average values of the number of "update steps" in the algorithm we discussed for finding the maximum value of a vector when it is applied to random permutations of the integers 1 through 4?
- (15 pts) How many reps would I have to use in a simulation study of a probability p to be sure that I will be 99% sure that I know p to within ± 0.01 ?
- (10 pts) For a simple linear regression model with zero intercept, that is, $y_i = \beta x_i + \epsilon_i$, for $i = 1, \dots, n$, use the result about sweeping the upper left hand corner of the matrix

$$A = \begin{bmatrix} X^T X & X^T y \\ y^T X & y^T y \end{bmatrix}$$

to find a formula for RSS .

- (10 pts) How is $x = -52.6875$ represented as a `real*4`?
- (10 pts) If I pass a matrix A that is declared to be 10×10 in the main program to a subroutine which is expecting the matrix B that is declared to be 5×5 in the subroutine, which element of A will be treated as B_{55} ?
- (10 pts) If I let X be the number of defective items in a random sample (without replacement) of n items from a group of N items, D of which are defective, then

$$f(x) = P(X = x) = \frac{\binom{D}{x} \binom{N-D}{n-x}}{\binom{N}{n}}.$$

If I know $f(x)$ for some x , how can I find $f(x+1)$ without actually evaluating the above formula?