APMA2821, HW 4

Due May 6.

Task 1.

Write functions to perform the following operation:

1.   Z[i] = Y[i]*Y[i]*W[i]   for i = 0,...N-1

2.   Y[i] = A*X[i]+Y[i]   for i = 0,...N-1

3.   s = sum(X[i]*Y[i]*W[i])   over i, for i = 0,...N-1

Optimize these functions for best performance on BlueGene/P.
Make sure you use proper alignment, minimize load and store operations as much
as you can. Create these functions using a) naïve implementation;   b) intrinsic; c)
appropriate "#pragma" directives .
Measure and compare performance of these functions. Use N = O(10) to O(10000).

Task 2.

Write a parallel program (with MPI), to perform the following:

   a) Read a 2D array from a disc such that each MPI-rank will store only a portion
       of the 2D array using standard block partitioning. Work with general 2D
       arrays of size NxN, with N from 5 to 10,000.
   b) Perform transformation of the 2D array from standard block distribution to
       2D block cycled distributed 2D array. Use block-size in the range of 1 to 256.

Task 3. (extra)

Using the results of Task 2 compute inverse of a non-singular matrix A of size NxN
with ScaLapack.

 You may work in pairs.