

# Homework 2

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## Question 1

The random matrixs are A and B, *matlabresult is the result computed by matlab, and the yourresult is the result computed by your naive method*, We use fro norm to calculate the error in computing matrix product

```
fprintf("Raw matrix A:\n");
A = rand(5, 5);

fprintf("Raw matrix B:\n");
B = rand(5, 5);

fprintf("A*B by matlab\n");
matlab_result = A*B

fprintf("A*B by yourself\n");
your_result = calculate_matrix(A,B)

error_result = your_result.-matlab_result;

fprintf("Error result is:\n");
norm(error_result, 'fro')
```

Raw matrix A:

Raw matrix B:

A\*B by matlab

matlab\_result =

0.88264	0.67326	0.19422	0.81040	1.06861
0.91942	1.03037	0.52540	0.88824	1.02150
0.88454	1.13177	0.43811	1.18984	1.12484

```

1.19768    0.73270    0.60775    1.01789    1.09111
1.10078    1.02858    0.45187    1.00775    1.19491
A*B by yourself
your_result =
0.88264    0.67326    0.19422    0.81040    1.06861
0.91942    1.03037    0.52540    0.88824    1.02150
0.88454    1.13177    0.43811    1.18984    1.12484
1.19768    0.73270    0.60775    1.01789    1.09111
1.10078    1.02858    0.45187    1.00775    1.19491
Error result is:
ans = 0

```

## Question2 Test vector norm-1,2,inf

```

random_vector = rand(100, 1);

% Calculate by the matlab

matlab_vector_1 = norm(random_vector, 1)
matlab_vector_2 = norm(random_vector, 2)
matlab_vector_inf = norm(random_vector, inf)

% calculate by yourself

x_vector_1 = sum(abs(random_vector))
x_vector_2 = sqrt(sum(random_vector.^2))
x_vector_inf = max(abs(random_vector))

error_1 = (x_vector_1-matlab_vector_1)/matlab_vector_1
error_2 = (x_vector_2-matlab_vector_2)/matlab_vector_2
error_inf = (x_vector_inf-matlab_vector_inf)/
    matlab_vector_inf

matlab_vector_1 = 49.276
matlab_vector_2 = 5.6272
matlab_vector_inf = 0.96591
x_vector_1 = 49.276
x_vector_2 = 5.6272
x_vector_inf = 0.96591
error_1 = 0
error_2 = 0
error_inf = 0

```

## Question2 Test vector norm-1,2,inf

```
random_matrix = rand(10, 10);
n = size(random_matrix, 2);
m = size(random_matrix, 1);
matlab_matrix_1 = norm(random_matrix, 1)
matlab_matrix_2 = norm(random_matrix, 2)
matlab_matrix_inf = norm(random_matrix, inf)

x_matrix_1 = max(sum(abs(random_matrix) (:,1:n),1))
x_matrix_2 = sqrt(max(eig(random_matrix'*random_matrix)))
x_matrix_inf = max(sum(abs(random_matrix) (1:m,:),2))

(matlab_matrix_1-x_matrix_1)/matlab_matrix_1
(matlab_matrix_2-x_matrix_2)/matlab_matrix_2
(matlab_matrix_inf-x_matrix_inf)/matlab_matrix_inf
```

```
matlab_matrix_1 = 6.6801
matlab_matrix_2 = 5.5423
matlab_matrix_inf = 6.6978
x_matrix_1 = 6.6801
x_matrix_2 = 5.5423
x_matrix_inf = 6.6978
ans = 0
ans = -1.6026e-16
ans = 0
```