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Introduction to Numerical Analysis

Math 323 – 01/03

1.a) What are the sizes of A, C, E, and F?

Size of A: 2x4

Size of C: 1x3

Size of E: 1x1

Size of F: 5x1

1.b) Which of these matrices are vectors? And which of these matrices are scalars? Which of these matrices are square?

Vectors: C and F

Scalars: E

Square: B and D

1.c) With MATLAB, find the following:

I. A23 = 3

II. FT = [2 -1 3 5 6]

III. (DT)43 = 5

2.a) A – B and B + D

A – B: [4 -1; 2 -6]

B + D: ‘undefined’

2.b) 5A: [20 5; 15 -10]

2.c) AB, BD, EC, EF, GE

AB: [1 12; -2 -2]

BD: [2 0 14; 3 2 28]

EC: [52 29]

EF: 13

GE: ‘undefined’

3.a) RM

Matrix R multiplied by Matrix M gives the row-vector [100 115 85 75]. The vector RM tells us the total number of ingredients needed for the order.

3.b) MC

Matrix R multiplied by Matrix C gives us the column-vector [108; 102; 182]. The vector MC tells us the total cost of making each cookie.

3.c) RS

Matrix R multiplied by Matrix S gives us the scalar of 8125. The scalar RS gives us the total earning for the number of cookies orders received.

3.d) R(S – MC)

Matrix R(S – MC) gives us the scalar of 2275. The scalar R(S – MC) gives us the total profit for the number of cookies orders received.

4.a)

4.b) 0.6480

4.c)

4.d) = 1.0e+03 \* [0.0698 0.0224; 0.0918 -1.4218; -0.0931 0.2157];

4.e) AB = 1.0e+05 \* [0.0505 1.7170; 0.1000 3.3835; 0.1496 5.0550];

4.f) There are 440 entries in the vector -345:pi:1035.

5.a) The value of ans is 9.

5.b) The value of ans is ‘undefined’.

5.c) Error: The expression to the left of the equals sign is not a valid target for an assignment.

6.a) Suppose that x = [1 2 3 4 5] is a row vector in the workspace. Find the value of the following commands. If the calculation is impossible, indicate what the issue is.

I. Calculation is impossible since the inner matrix dimension doesn’t agree.

II. 55

III. [1 2 3 4 5; 2 4 6 8 10; 3 6 9 12 15; 4 8 12 16 20; 5 10 15 20 25];

IV. [1 4 9 16 25]

6.b) Suppose x is a column vector in the workspace. Give the MATLAB command to calculate the value of ||x||.

norm(x) would calculate the value of ||x||.

6.c) Suppose A = [-2 5; 1 -3] is a matrix in the workspace. Find the value of B in each case.

 I. >> B = A \* A = [9 -25; -5 14]

II. >> B = A.\*A = [4 25; 1 9]

III. >> B = A(2, 1) = 1

IV. >> B = A(:, 2) = [5; -3]

V. >> B = A(1, :) = [-2 5]

7.a)

1)

2)

3) Vertical Asymptotes: None.

4) Location of jump discontinuities: None

5) Location of any holes: x = 0

7.c)

Graph of

Graph of

1)

2)

3) Vertical Asymptotes: None.

4) Location of jump discontinuities: None

5) Location of any holes: None

8) s = 0; for n = 0:100, s = s + ½^n; end. What’s the exact

expression for s when n = 100?

The exact expression for s when n = 100 is 2 since  
it is a geometric summation. 1 + ½ + ¼ + … = 2

9.a) Fill in the blanks in the summary table of the loop

|  |  |
| --- | --- |
| Initial | s = 0 |
| i = 1 | s = 0 + abs(x(1) – x(2)) |
| i = 2 | s = abs(x(1) – x(2)) + abs(x(2) – x(3)) |
| i = 3 | s = abs(x(1) – x(2)) + abs(x(2) – x(3)) + abs(x(3) – x(4)) |
| .  .  . |  |
| i = n-1 | s = abs(x(1) – x(2)) + abs(x(2) – x(3)) + abs(x(3) – x(4)) + … + abs(x(n-1) + x(n+1)) |

9.b) What would the final value of s be if x = (1,3,5,7,9,11)? 10

9.c) What would the final value of s be if x = (2,8,4,1,7)? 19

10. (1)(2) + (3)(4) + (5)(6) + … + (299)(300)

s = 0

for i = 1:2:299, s = s + (i \* (i + 1)); end

11. for a given vector x = (x1, x2, x3, …, xn) calculate the 2-norm.

for i = 1:length(x), s = s + x(i)^2; end

s = sqrt(x);

12) (a), (b), (c), and (e) will assign the values.