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2 % 11.29.2021
3 % ECE 202 Fall 2021 MATLAB Exercise M8
4 % Writing a partial fraction expansion and finding the coefficients
5 % From the equation  $R(x) = (6 + 5x + 4x^2)/((x - 1)(x - 2)(x - 3))$ 
6
7 clear
8
9 % ----- Calculations -----
10
11 N = input("Enter the number of points visited by the function \n");
12 % input function for user defined number of points
13 x = linspace(-4, 4, N); % array of x axis values for checks
14
15 Nx = 6 + 5*x + 4*x.^2;
16 D1 = x - 1; % each function in the denominator
17 D2 = x - 2;
18 D3 = x - 3;
19 Rx = Nx./(D1.*D2.*D3);
20
21 N = [4; 5; 6]; % column array for answers of A*c
22 % values are from Nx, in reverse
23 A = [1, 1, 1;
24      -5, -4, -3;
25       6, 3, 2]; % matrix A for solving the system as seen in handwork
26
27 c = A\N % gives c values in matrix
28
29 R1 = c(1)./D1; % R1-R3 values calculated with c(n)./Dn
30 R2 = c(2)./D2; % ./ function necessary here for matrix multiplication
31 R3 = c(3)./D3;
32
33 % ----- Checking -----
34
35 % subtracts each Rn(x) value from the whole equation R(x)
36 % dR refers to change in R
37 dR = sum(abs(Rx - R1 - R2 - R3))
38 % This should output values close to zero, and is used to check the c
39 % values. If the values are really far from zero, the c values are
40 % incorrect, or when "NaN" prints, a 1, 2, or 3 has been tested, which
41 % divides the denominator by zero, making the check fail.
42 % Some values will trigger this, but mostly odds.
43 % 5, 9, 13, 17, 29, 33, 45, 113 are some examples of the check failing
44
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