



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Here is my code: function s = simpson(f_str, a, b, h) f = inline(f_str); n = (b-a)/h; x = and + [1:n-1]*h; xi = and + [1:n]*h; s = h/3 * (f(a) + f(b) + 2*sum(f(x)) + 4*sum(f(xi))); end Can anyone help find out where the wrong part is? The Simpson rule or method, named after the mathematician Thomas Simpson, is a popular numerical analysis technique for numerical integration of certain integrals. This forms an even number of intervals and fits the dish in each pair of intervals. The method also corresponds to the three-point Newton-Cotes Quadrature rule. In earlier courses, we have already discussed the C program for the Simpsons 1/3 rule. Here we will write a program for Simpson 1/3 rule in MATLAB, and go through his mathematical derivation and numerical example. Derivation of Simpson Rule 1/3: Consider the polynomic equation f(x) = 0 to be numerically integrated, as shown in the figure below: In figure f(x), it means that the actual existing curve and P(x) is a parabolic approximation between two intervals. Suppose the initial value of abscissa, x0 = and the final value of abscissa, xn = b Let m be the value of abscissa so that that, m = (and + b) / 2 Using Lagrange polynomic interpolation, the expression for P(x) can be given as: P(x) = f(a) [(x-m) (x-b)] / [(a-m) (a-b)] + f(m) [(x-a) (x-b)] / [(m - a) (m) + f(b) [(x - a) (x - m)] / [(b - a) (b - m)] Replacement of the value 'm' and integration in the interval [a, b], which is the desired expression. The Simpson rule code in Matlab is based on this formula. Rule Simpson 1/3 in MATLAB code: Simpson rule MATLAB Program function l = simpson3_f (f) f = @(x) 2 + cos (2*sqrt(2)) % to calculate integrals using Simpson rule 1/3 when the function %requesting range and required accuracy R= input is known(Enter integration limits [x_min, x_max]); tol = input ('Error allowed in final response: '); a = R(1,1); b = R(1,2); %intial h n n = 100; h = (b - a)/100; %to calculate the maximum f''''(x) in the given area for k = 0:100 x(1, k+1) = and + k*h ; y4(1, k+1) = feval (f, x(1,k+1) + 4*h) - 4*feval(f, x(1,k+1) + 3*h)... + 6*feval(f, x(1,k+1) + 2*h) - 4* feval (f, x(1,k+1) + h) ... + feval(f, x(k+1));% end of the fourth difference in order [y i] = max(y4); x_opt = x(1,i); % for the calculation of the required value h m=0; ddf = feval (f, x_opt + 4*h) - 4*feval(f, x_opt + 3*h)... + 6*feval(f, x_opt + 2*h) - 4* feval (f, x_opt + h) ... + feval(f, x_opt);% fourth difference in order % ddf defined outside the holder only for convinence, while ddf * (b -a)/180 >tol % error for Simpson rule 1by3 m = m +1; h = h*10^-m; ddf = feval (f, x_opt + 4*h) - 4*feval(f, x_opt + 3*h)... + 6*feval(f, x_opt + 2*h) - 4* feval (f, x_opt + h) ... + feval(f, x_opt); if rem(n,2) == 0 n = n+1; end h = (b-a)/n; % calculation of matrix X for k = 1:(n+1) X(k,1) = a + (k-1)*h; X(k,2) =feval (f, X(k,1)); end %integration calculation i= 1; l1 = 0; while (2^i) < (n+1) l1 = l1 + X ((2^i) , 2); i = i +1; end j=1; l2 =0; zatimco (2^j + 1) < (n+1) l2 = l2 + X ((2^j + 1) , 2); j = j + 1; end l = h/3 * (X(1,2) + 4*11 + 2*12 + X(n,2));% Simpsonovo pravidlo 1/3 % Zobrazit konečný výsledek h n disp(sprintf(' Použití této integrace pro danou funkci v rozsahu (%10f , %10f) je %10.6f ',a,b,l)) 123456789101111131415161718192021222242526272829303132333335373738394041424344444546474850515253545555555960616263646667 funkce l = simpson3_f (f) f = @(x) 2 + cos (2*sqrt(2)) % pro výpočet integrálů pomocí Simpsonova pravidla 1/3, pokud je funkce známa%žádá o rozsah a požadovanou přesnost R = vstup('Zadejte limity integrací [x_min, x_max] '); tol = vstup ('Chyba povolená v konečné odpovědi: '); a = R(1,1); b = R(1,2); %intial h a n n = 100; h = (b -a)/100;%pro výpočet maxima f''''(x) v dané oblasti pro k = 0:100 x(1, k+1) = a + k*h ; y4(1, k+1) = feval (f, x(1,k+1) + 4*h) - 4*feval(f, x(1,k+1) + 3*h)... + 6*feval(f, x(k+1) + 2*h) - 4* feval (f, x(1,k+1) + h) ... + feval(f, x(k+1));% end of the fourth difference in order [y i] = max(y4); x_opt = x(1,i); % for the calculation of the required value h m=0; ddf = feval (f, x_opt + 4*h) - 4*feval(f, x_opt + 3*h)... + 6*feval(f, x_opt + 2*h) - 4* feval (f, x_opt + h) ... + feval(f, x_opt);% fourth difference in order % ddf defined outside the holder only for convinence, while ddf * (b -a)/180 >tol % error for Simpson rule 1by3 m = m +1; h = h*10^-m; ddf = feval (f, x_opt + 4*h) - 4*feval(f, x_opt + 3*h)... + 6*feval(f, x_opt + 2*h) - 4* feval (f, x_opt + h) ... + feval(f, x_opt);% here defined to repeat the end of the %calculation n = ceil((b-a)/h); if rem(n,2) == 0 n = n+1; end h = (b-a)/n;% calculation of matrix X for k = 1:(n+1) X(k,1) = a + (k-1)*h; X(k,2) =feval (f, X(k,1)); end%integration calculation= 1; l1 = 0; while (2^i) < (n+1) l1 = l1 + X ((2^i) , 2); i = i +1;endj=1; l2 =0;while (2^j + 1) < (n+1) l2 = l2 + X ((2^j + 1) , 2); j = j + 1;endl = h/3 * (X(1,2) + 4*11 + 2*12 + X(n,2));% Simpson rule 1/3% Show final resultdisp(sprintf(' Use this integration for in the range (%10f , %10f) is %10.6f ',a,b,l)) The above matlab code is intended for Simpson rule 1/3 for evaluation of function f(x) = 2 + cos(2). If the code is to be used to evaluate the numerical integration of other integrals, the f value in the program can be adjusted as required. In this MATLAB program, the input is the interval at which numerical integration and the allowed error or tolerance are to be performed. After you enter these inputs into the program, the numeric integration value of the function appears on the screen. A sample snapshot of the program's I/O is shown below: Simpson 1/3 Numeric Example Rule: Now let's analyze the mathematically mentioned Simpson Rules program in Matlab using the same functionality and integration limits. The question is here: Evaluate the following integral using simpson 1/3 rule with m = 1 and 2. Solution: Given integrand is : f(x) = 2 + cos(2) Graph f(x) can be viewed as follows: Graph f(x) When m =1, using the expression for Simpson rule 1/3: l = When m = 2 l = which is almost the same as the value obtained from Simpson's Matlab program. If you have any questions about Simpson's rule/method, his Matlab code or mathematical derivatives, bring them from the comments. You can find more numerical methods tutorial using Matlab here. How do I write a Matlab code based on Simpson's 1/3 rule to integrate functionality from data? That's what I haven't yet, but Im getting error :(func_vec = [1.5 2 2 1.6363 1.2500 0.9565];a = 0;b = 2 ;,n = length(func_vec)-1,h = (b-a)/n;xi = a;b:f_1sets = sum(func_data(2:2:end)); f_2sets = sum(func_data(3:2:end-2));l = h/3*(func_vec(1) + 4*f_1sets + 2*f_2sets + func_vec(end)); RES = SIMPSON (Y) calculates the approximation of integral Y using Simpson rule 1/3 (with unit spacing). Simpson Rule 1/3 uses quadratic interpolants for numerical integration. To calculate integral for spaces different from one, multiply the OS by an increment of spaces. For SIMPSON(Y) is an integral part of Y. For matrices, SIMPSON(Y) is a row vector with integral above each column. For the N-D array, simpson(s) works through the first non-singleton dimension. RES = SIMPSON (X,Y) calculates integral Y with respect to X using Simpson rule 1/3. X and Y must be vectors of the same length or X must be vector columns and Y fields whose first non-singleton dimension is length (X). SIMPSON works along this dimension. Note that X must be evenly distributed to correctly implement rules 1/3 and 3/8. If X is not evenly distributed, trapezoidal rule (TRAPZ MATLAB) is recommended. RES = SIMPSON(X,Y,DIM) or SIMPSON(Y,DIM) integrates across dim dimension Y. Length X must be the same as size (Y, DIM)). RES = SIMPSON (X, Y, DIM, RULE) can be used to switch between Simpson Rule 1/3 and Simpson Rule 3/8. Simpson's 3/8 rule uses cubic interpolants to achieve numerical integration. If a default value for DIM is required, assign an empty array. - Rule options [DEFAULT] 1/3 Simpson rule for quadratic interpolants 3/8 Simpson rule for cubic interpolants Examples: % Integration Y = SIN(X) x = 0:0.2*pi; y = sin(x); a = sum(s)*0.2; % Rectangular rule b = trapz(x,y); % trapezoidal rule c = simpson(x,y,[],'1/3'); % Simpson rule 1/3 d = simpson(x,y,[],'3/8'); % Simpson rule 3/8 e = cos(x(1))-cos(x(end)); % Actual integral fprintf(rectangle rule: %15f, (a) fprintf(Trapezoid rule: %15f, b) fprintf(Simpson rule 1/3: %15f, c) fprintf(Simpson rule 3/8: %15f, d) fprintf(Actual integral: %15f, e) % x1 = linspace(0,2,4); x2 = linspace(0,2,7); x4 = linspace(0,2,13); y = @(x) 2*cos(2*sqrt(x)); long format y1 = y(x1); res1 = simpson(x1,y1,[],'3/8'); disp(res1) y2 = y(x2); res2 = simpson(x2,y2,[],'3/8'); disp(res2) y4 = y(x4); res4 = simpson(x4,y4,[],'3/8'); disp(res4) Class support for X, Y inputs: float: double, single See also sum, cumsum, trapz, cumtrapz. cumtrapz.

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