```
 1
 2 function [x,w]=g_int(N,a,b)
 3
 4 % This script is for computing definite integrals using Legendre-Gauss
 5 % Quadrature. Computes the Legendre-Gauss nodes and weights  on an interval
 6 % [a,b] with truncation order N
 7 %
 8 % Suppose you have a continuous function f(x) which is defined on [a,b]
 9 % which you can evaluate at any x in [a,b]. Simply evaluate it at all of
10 % the values contained in the x vector to obtain a vector f. Then compute
11 % the definite integral using sum(f.*w);
12     N=N-1;
13     N1=N+1; N2=N+2;
14     xu=linspace(-1,1,N1)';
15     % Initial guess
16     y=cos((2*(0:N)'+1)*pi/(2*N+2))+(0.27/N1)*sin(pi*xu*N/N2);
17     % Legendre-Gauss Vandermonde Matrix
18     L=zeros(N1,N2);
19     % Derivative of LGVM
20     Lp=zeros(N1,N2);
21     % Compute the zeros of the N+1 Legendre Polynomial
22     % using the recursion relation and the Newton-Raphson method
23     y0=2;
24     % Iterate until new points are uniformly within epsilon of old points
25     while max(abs(y-y0))>eps
26
27
28         L(:,1)=1;
29         Lp(:,1)=0;
30
31         L(:,2)=y;
32         Lp(:,2)=1;
33
34         for k=2:N1
35             L(:,k+1)=( (2*k-1)*y.*L(:,k)-(k-1)*L(:,k-1) )/k;
36         end
37
38         Lp=(N2)*( L(:,N1)-y.*L(:,N2) )./(1-y.^2);
39
40         y0=y;
41         y=y0-L(:,N2)./Lp;
42
43     end
44     % Linear map from[-1,1] to [a,b]
45     x=(a*(1-y)+b*(1+y))/2;
46     % Compute the weights
47     w=(b-a)./((1-y.^2).*Lp.^2)*(N2/N1)^2;
48 end
```