## Problem 1

|  |
| --- |
|  |

求函数在指定点的数值导数，x=1,2,3



### MATLAB Code

|  |  |
| --- | --- |
|  | |
| 1  2  3  4  5  6  7  8  9  10  11  12  13  14 | *%% problem 1*  syms x  A = det([x      x^2     x^3;           1      2\*x     3\*x^2;           0      2       6\*x]);  dA = diff(A);  xx = [1 2 3];  subs(dA,xx)  clearvars x xx A dA |
|  | |

### Output

|  |  |
| --- | --- |
|  | |
|  | ans =    [6, 24, 54] |
|  | |

## Problem 2

用数值方法求定积分





### MATLAB Code

|  |  |
| --- | --- |
|  | |
| 1  2  3  4  5  6  7  8  9  10  11  12  13  14  15  16  17  18  19  20  21  22  23  24  25 | *%% problem 2*  format long  [w,x] = GaussLegendreCoef(8);  *% problem 2-1*  f =@(*t*) cos(t.^2) + 4\*sin(4\*t.^2) +1;  a = 0;  b = 2\*pi;  t = 0.5\*(b-a).\*x +0.5\*(b+a);  I1 = 0.5\*(b-a)\*sum(w.\*f(t));  I1  clearvars a b f t  *% problem 2-2*  f =@(*x*) log(1+x)./(1+x.^2);  a = 0;  b = 1;  t = 0.5\*(b-a).\*x +0.5\*(b+a);  I2 = 0.5\*(b-a)\*sum(w.\*f(t));  I2  clearvars |
|  | |

### MATLAB function

|  |  |
| --- | --- |
|  | |
| 1  2  3  4  5  6  7  8  9  10  11  12  13  14  15  16  17  18  19  20  21  22  23  24 | function [*w*,*x*] = GaussLegendreCoef(*n*)  *%GaussLegendreCoef Calculate Gauss-Legendre quadrature coefficients and Gaussian points.*  *%*  *%   [w,x] = GaussLegendreCoef(n)*  *%*  *%   Input*  *%       n - number of Gaussian points*  *%   Output*  *%       w - Gauss-Legendre quadrature coefficients*  *%       x - Gaussian points*  *%*      polyPrevious = 1;      polyCurrent = [1 0];  *for* i = 1:n          polyForward = [polyCurrent\*(2\*i+1)/(i+1) 0];          polyForward = polyForward - [0 0 polyPrevious\*i/(i+1)];          polyPrevious = polyCurrent;          polyCurrent = polyForward;  *End*      x = roots(polyPrevious);      w = 2\*(1-x.^2)./((n+1)\*polyval(polyCurrent,x)).^2;  End |
|  | |

### Output

|  |  |
| --- | --- |
|  | |
|  | I1 =  14.255711356520822  I2 =  0.272198261261199 |
|  | |

## Problem 3

分别用3种不同的数值方法解线性方程组。



### MATLAB Code

|  |  |
| --- | --- |
|  | |
| 1  2  3  4  5  6  7  8  9  10  11  12  13  14  15  16  17  18  19 | *%% problem 3*  A = [6      5       -2      5;       9      -1      4       -1;       3      4       2       -2;       3      -9      0       2];  b = [-4;       3;       1;       11];  x = A\b  x = inv(A)\*b  [L,U,P]=lu(A);  x = U\(L\P\*b)  clearvars |
|  | |

### Output

|  |  |
| --- | --- |
|  | |
|  | x =  4.833333333333337  -1.833333333333333  -13.083333333333343  -10.000000000000004  x =  4.833333333333337  -1.833333333333333  -13.083333333333343  -10.000000000000005  x =  4.833333333333337  -1.833333333333333  -13.083333333333343  -10.000000000000004 |
|  | |