1951. ∵ E9(x) = |sin(θ \* x + 10 / 2 \* pi) \* x ^ 10 / 10!|

= |sin(θ \* x) \* x ^ 10 / 10!|

≤ |θ \* x ^ 11 / 10!|

当θ \* x = 0取“=“

θ ∈ [0, 1]

∵ x ∈ [-1, 1]

∴ E9(x) < 1 / 10!

∵ 2.75574e-7 \* 10! = 1.0000029312 ＞ 1

∴ E9(x) ＜ 1 / 10! ≤ 2.75574e-7

1952. ∵ E8(x) = |cos(θ \* x + 10 / 2 \* pi) \* x ^ 9 / 9!|

= |cos(θ \* x) \* x ^ 9 / 9!|

≤ |x ^ 9 / 9!|

当θ \* x = 0取“=“

θ ∈ [0, 1]

∵ x ∈ [-1, 1]

∴ E9(x) < 1 / 9!

∵ 2.75574e-6 \* 9! = 1.0000029312 ＞ 1

∴ E9(x) ＜ 1 / 9! ≤ 2.75574e-6

2052.

%Horner.m

function [P] = Horner(a, c)

b = zeros(size(a));

b(size(a)) = a(size(a));

for i = size(a, 1) - 1:-1:1

b(i) = b(i + 1) \* c + a(i);

end

P = b(1);

end

%derivative.m

function [d] = derivative(a, c)

ad = a(1:size(a, 1) - 1) .\* (size(a, 1) - 1:-1:1);

d = Horner(ad, c);

end

%definite\_integral.m

function [i] = definite\_integral(a, c1, c2)

ai = [a ./ (size(a, 1):-1:1)'; 1];

i = Horner(ai, c2) - Horner(ai, c1);

end

%eliminate.m

function [UY] = eliminate(AB)

for i = 2:size(AB, 1)

for j = 1:(i - 1)

AB(i, :) = AB(i, :) - AB(i, j) / AB(j, j) \* AB(j, :);

end

end

UY = AB;

end

%solve.m

function [solution] = solve(UV)

solution = zeros(size(UV, 1), 1);

for i = size(UV, 1):-1:1

UV(i, :) = UV(i, :) / UV(i, i);

for j = 1:(i - 1)

UV(j, :) = UV(j, :) - UV(j, i) / UV(i, i) \* UV(i, :);

end

solution(i) = UV(i, size(UV, 2));

end

end

%p205t2.m

a = [-0.04; 0.14; -0.16; 2.08];

P4 = Horner(a, 4);

Pd4 = derivative(a, 4);

Pt4 = definite\_integral(a, 0, 3);

P45 = Horner(a, 4.5);

x = [0; 1; 2; 4];

y = [2.08; 2.02; 2.00; 1.12];

AB = [x.^0, x.^1, x.^2, x.^3, y];

coe = solve(eliminate(AB));

(a) P(3) = 55.100000000000010

(b) P’(4) = -3.18000000000000

(c) P(4.5) = 1.868900000000000e+02

(d) coef = 2.08000000000000

-0.160000000000000

0.140000000000000

-0.0400000000000000

2171.

(a)

∵ f(-1) = -1

f(0) = 0

∴ P1(x) = f(-1) \* (x – 0) / (-1 - 0) +

f(0) \* (x – (-1)) / (0 – (-1))

= x

(b)

∵ f(-1) = -1

f(0) = 0

f(1) = 1

∴ P2(x) = f(-1)\*(x–0)\*(x-1)/((-1-0)\*(-1-1))+

f(0)\*(x–(-1))\*(x-1)/((0–(-1))\*(0-1))+

f(1)\*(x-(-1))\*(x-0)/((1-(-1))\*(1-0))

= x\*(x-1)/(-2)+(x+1)\*x/2

= x

(c)

∵ f(-1) = -1

f(0) = 0

f(1) = 1

f(2) = 8

∴ P3(x) = f(-1)\*(x–0)\*(x-1)\*(x-2)/

((-1-0)\*(-1-1)\*(-1-2))+

f(0)\*(x–(-1))\*(x-1)\*(x-2)/

((0–(-1))\*(0-1)\*(0-2))+

f(1)\*(x-(-1))\*(x-0)\*(x-2)/

((1-(-1))\*(1-0)\*(1-2))+

f(2)\*(x-(-1))\*(x-0)\*(x-1)/

((2-(-1))\*(2-0)\*(2-1))

= x\*(x-1)\*(x-2)/6+

(x+1)\*x\*(x-2)/(-2)+

8\*(x+1)\*x\*(x-1)/6

= (x^2-2\*x)\*((x-1)/6-(x+1)/2)+4/3\*(x^3-x)

= (x^2-2\*x)\*(-x/3-2/3)+4/3\*(x^3-x)

= 1/3\*((2\*x-x^2)\*(x+2)+4\*x^3-4\*x)

= x^3

(d)

∵ f(1) = 1

f(2) = 8

∴ P4(x) = f(1) \* (x – 2) / (1 - 2) +

f(2) \* (x – 1) / (2 – 1)

= -x + 2 + 8 \* x – 8

= 7 \* x - 6

(e)

∵ f(0) = 0

f(1) = 1

f(2) = 8

∴ P5(x) = f(0)\*(x-1)\*(x-2)/((0-1)\*(0-2))+

f(1)\*(x-0)\*(x-2)/((1-0)\*(1-2))+

f(2)\*(x-0)\*(x-1)/((2-0)\*(2-1))

= x\*(x-2)/(-1)+4\*x\*(x-1)

= x\*(2-x+4\*x-4)

= 3\*x^2-2\*x

2172.

(a)

∵ f(1) = 3

f(2) = 3

f(2.5) = 3.3

∴ P(x) = f(1)\*(x-2)\*(x-2.5)/((1-2)\*(1-2.5))+

f(2)\*(x-1)\*(x-2.5)/((2-1)\*(2-2.5))+

f(2.5)\*(x-1)\*(x-2)/((2.5-1)\*(2.5-2))

= 2\*(x-2)\*(x-2.5)

-6\*(x-1)\*(x-2.5)

+4.4\*(x-1)\*(x-2)

∴ P(1.5) = 2\*(-0.5)\*(-1)

-6\*0.5\*(-1)

+4.4\*0.5\*(-0.5)

= 1 + 3 – 1.1

= 2.9

P(1.2) = 2\*(-0.8)\*(-1.3)

-6\*0.2\*(-1.3)

+4.4\*0.2\*(-0.8)

= 2.936

(b)

∵ f(0.5) = 4.5

f(1) = 3

f(2) = 3

f(2.5) = 3.3

∴ P(x) = f(0.5)\*(x-1)\*(x-2)\*(x-2.5)/

((0.5-1)\*(0.5-2)\*(0.5-2.5))+

f(1)\*(x-0.5)\*(x-2)\*(x-2.5)/

((1-0.5)\*(1-2)\*(1-2.5))+

f(2)\*(x-0.5)\*(x-1)\*(x-2.5)/

((2-0.5)\*(2-1)\*(2-2.5))+

f(2.5)\*(x-0.5)\*(x-1)\*(x-2)/

((2.5-0.5)\*(2.5-1)\*(2.5-2))

= -3\*(x-1)\*(x-2)\*(x-2.5)

+4\*(x-0.5)\*(x-2)\*(x-2.5)

-4\*(x-0.5)\*(x-1)\*(x-2.5)

+2.2\*(x-0.5)\*(x-1)\*(x-2)

∴ P(1.5) = -3\*0.5\*(-0.5)\*(-1)

+4\*(-0.5)\*(-1)

-4\*0.5\*(-1)

+2.2\*0.5\*(-0.5)

= 2.7

P(1.2) = -3\*0.2\*(-0.8)\*(-1.3)

+4\*0.7\*(-0.8)\*(-1.3)

-4\*0.7\*0.2\*(-1.3)

+2.2\*0.7\*0.2\*(-0.8)

= 2.7696

2297.

%divided\_difference\_table.m

function [t] = divided\_difference\_table(f)

t = [f, zeros(size(f, 1), size(f, 1) - 1)];

for i = 2:size(f, 1)

t(i:size(f, 1), i) = (t(i:size(f, 1), i - 1) - t(i - 1:size(f, 1) - 1, i - 1)) / (i - 1);

end

end

%p229t7

xk = [0; 1; 2; 3; 4];

f = [0; 0.75; 2.25; 3; 2.25];

t = divided\_difference\_table(f);

real\_t = [xk, t];

x = 1.5;

P1 = zeros(size(f, 1) - 1, 1);

tt = t(1:size(t, 1) + 1:size(t, 1) \* size(t, 1));

tt(1, 2:size(tt, 2)) = tt(1, 2:size(tt, 2)) \* (x - xk(1, 1));

P1(1) = t(1, 1) + tt(1, 2);

for i = 2:size(f, 1) - 1

tt(1, i + 1:size(tt, 2)) = tt(1, i + 1:size(tt, 2)) \* (x - xk(i, 1));

P1(i) = P1(i - 1) + tt(1, i + 1);

end

y1 = 3 \* (sin(pi \* x / 6)) ^ 2;

d1 = abs(P1 - y1);

x = 3.5;

P2 = zeros(size(f, 1) - 1, 1);

tt = t(1:size(t, 1) + 1:size(t, 1) \* size(t, 1));

tt(1, 2:size(tt, 2)) = tt(1, 2:size(tt, 2)) \* (x - xk(1, 1));

P2(1) = t(1, 1) + tt(1, 2);

for i = 2:size(f, 1) - 1

tt(1, i + 1:size(tt, 2)) = tt(1, i + 1:size(tt, 2)) \* (x - xk(i, 1));

P2(i) = P2(i - 1) + tt(1, i + 1);

end

y2 = 3 \* (sin(pi \* x / 6)) ^ 2;

d2 = abs(P2 - y2);

(a)

xk f[xk] 1st 2nd 3rd 4th

0 0 0 0 0 0

1 0.7500 0.7500 0 0 0

2 2.2500 1.5000 0.3750 0 0

3 3.0000 0.7500 -0.3750 -0.2500 0

4 2.2500 -0.7500 -0.7500 -0.1250 0.03125

(b)

P1(x) = 0.75\*x

P2(x) = 0.75\*x+0.375\*x\*(x-1)

P3(x) = 0.75\*x+0.375\*x\*(x-1)-0.25\*x\*(x-1)\*(x-2)

P4(x) = 0.75\*x+0.375\*x\*(x-1)-0.25\*x\*(x-1)\*(x-2)

+0.03125\*x\*(x-1)\*(x-2)\*(x-3)

(c)

x = 1.5:

1.12500000000000

1.40625000000000

1.50000000000000

1.51757812500000

x = 3.5:

2.62500000000000

5.90625000000000

2.62500000000000

2.83007812500000

(d)

f(1.5) = 1.500000000000000

f(3.5) = 2.79903810567666

设d = abs(f(x) – P(x))

d:

0.375000000000000

0.0937499999999996

4.44089209850063e-16

0.0175781250000004

d:

0.174038105676658

3.10721189432334

0.174038105676658

0.0310400193233420

除少数上升，总体来说，d是在下降的