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Matlab Part 2

Excersize 1)

function [x1,x2] = quadratic(a,b,c)

disc = sqrt((b^2) - 4\*a\*c);

x1 = ((-1)\*b + disc)/(2\*a);

x2 = ((-1)\*b - disc)/(2\*a);

end

(a)

>> [x1,x2] = quadratic(1,0,-1)

x1 =

1

x2 =

-1

(b)

>> [x1,x2] = quadratic(1,0,1)

x1 =

0.0000 + 1.0000i

x2 =

0.0000 - 1.0000i

(c)

>> [x1,x2] = quadratic(1,2,1)

x1 =

-1

x2 =

-1

(d)

>> [x1,x2] = quadratic(8,10,-3)

x1 =

0.2500

x2 =

-1.5000

Excersize 2)

function [x,y] = Eul(h,x0,y0,xf)

k = 1;

x(k) = x0;

y(k) = y0;

while(x(k) + h <= xf + 10^-10)

x(k+1) = x(k) + h;

y(k+1) = y(k) + h\*(x(k) + y(k));

k = k + 1;

end

end

>> [x,y]=Eul(0.1,0,2,3)

x =

Columns 1 through 11

0 0.1000 0.2000 0.3000 0.4000 0.5000 0.6000 0.7000 0.8000 0.9000 1.0000

Columns 12 through 22

1.1000 1.2000 1.3000 1.4000 1.5000 1.6000 1.7000 1.8000 1.9000 2.0000 2.1000

Columns 23 through 31

2.2000 2.3000 2.4000 2.5000 2.6000 2.7000 2.8000 2.9000 3.0000

y =

Columns 1 through 11

2.0000 2.2000 2.4300 2.6930 2.9923 3.3315 3.7147 4.1462 4.6308 5.1738 5.7812

Columns 12 through 22

6.4594 7.2153 8.0568 8.9925 10.0317 11.1849 12.4634 13.8798 15.4477 17.1825 19.1007

Columns 23 through 31

21.2208 23.5629 26.1492 29.0041 32.1545 35.6300 39.4630 43.6893 48.3482

plot(x,y)

The new value of y(3) is closer to the real value of y(3) because the step size is smaller so the tangent lines will deviate less from the real curve.

Excersize 3)

function [x,y] = Eul(h,x0,y0,xf)

k = 1;

x(k) = x0;

y(k) = y0;

while(x(k) + h <= xf + 10^-10)

x(k+1) = x(k) + h;

y(k+1) = y(k) + h\*(x(k) \* exp(3\*x(k)) - 2 \* y(k));

k = k + 1;

end

end

>> [x,y] = Eul(0.25,0,0,2)

x =

0 0.2500 0.5000 0.7500 1.0000 1.2500 1.5000 1.7500 2.0000

y =

0 0 0.1323 0.6264 2.0921 6.0675 16.3216 41.9172 104.3313

Excersize 4)

function [x,y] = Eul\_improved(h, x0, y0, xf)

k = 1;x(k) = x0;

y(k) = y0;

while (x(k)+h<=xf+10^-10)

x(k+1) = x(k)+h;

y\_predict = y(k)+h\*(x(k)\*exp(3\*x(k))-2\*y(k));

y(k+1) = y(k)+0.5\*h\*(x(k)\*exp(3\*x(k))-2\*y(k)) + (x(k+1)+y\_predict);

k = k+1;

end

>> [x,y] = Eul\_improved(0.25, 0, 0, 2)

x =

0 0.2500 0.5000 0.7500 1.0000 1.2500 1.5000 1.7500 2.0000

y =

0 0.2500 1.0110 2.8540 7.2360 17.8270 43.7155 107.0291 260.8454

Exercize 5)

(a)

function [x,y] = Eul\_5(h,x0,y0,xf)

k = 1;

x(k) = x0;

y(k) = y0;

while(x(k) + h <= xf + 10^-10)

x(k+1) = x(k) + h;

y(k+1) = y(k) + h\*(-2\*y(k));

k = k + 1;

end

end

>> [x,y]=Eul\_5(0.1,0,3,5)

x =

Columns 1 through 11

0 0.1000 0.2000 0.3000 0.4000 0.5000 0.6000 0.7000 0.8000 0.9000 1.0000

Columns 12 through 22

1.1000 1.2000 1.3000 1.4000 1.5000 1.6000 1.7000 1.8000 1.9000 2.0000 2.1000

Columns 23 through 33

2.2000 2.3000 2.4000 2.5000 2.6000 2.7000 2.8000 2.9000 3.0000 3.1000 3.2000

Columns 34 through 44

3.3000 3.4000 3.5000 3.6000 3.7000 3.8000 3.9000 4.0000 4.1000 4.2000 4.3000

Columns 45 through 51

4.4000 4.5000 4.6000 4.7000 4.8000 4.9000 5.0000

y =

Columns 1 through 11

3.0000 2.4000 1.9200 1.5360 1.2288 0.9830 0.7864 0.6291 0.5033 0.4027 0.3221

Columns 12 through 22

0.2577 0.2062 0.1649 0.1319 0.1056 0.0844 0.0676 0.0540 0.0432 0.0346 0.0277

Columns 23 through 33

0.0221 0.0177 0.0142 0.0113 0.0091 0.0073 0.0058 0.0046 0.0037 0.0030 0.0024

Columns 34 through 44

0.0019 0.0015 0.0012 0.0010 0.0008 0.0006 0.0005 0.0004 0.0003 0.0003 0.0002

Columns 45 through 51

0.0002 0.0001 0.0001 0.0001 0.0001 0.0001 0.0000

(b)

function [x,y] = Eul\_improved\_5(h, x0, y0, xf)

k = 1;x(k) = x0;

y(k) = y0;

while (x(k)+h<=xf+10^-10)

x(k+1) = x(k)+h;

y\_predict = y(k)+h\*(-2\*y(k));

y(k+1) = y(k)+0.5\*h\*(-2\*y(k)) + (x(k+1)+y\_predict);

k = k+1;

end

>> [x,y] = Eul\_improved\_5(0.1,0,3,5)

x =

Columns 1 through 11

0 0.1000 0.2000 0.3000 0.4000 0.5000 0.6000 0.7000 0.8000 0.9000 1.0000

Columns 12 through 22

1.1000 1.2000 1.3000 1.4000 1.5000 1.6000 1.7000 1.8000 1.9000 2.0000 2.1000

Columns 23 through 33

2.2000 2.3000 2.4000 2.5000 2.6000 2.7000 2.8000 2.9000 3.0000 3.1000 3.2000

Columns 34 through 44

3.3000 3.4000 3.5000 3.6000 3.7000 3.8000 3.9000 4.0000 4.1000 4.2000 4.3000

Columns 45 through 51

4.4000 4.5000 4.6000 4.7000 4.8000 4.9000 5.0000

y =

1.0e+12 \*

Columns 1 through 11

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

Columns 12 through 22

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

Columns 23 through 33

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0001

Columns 34 through 44

0.0001 0.0002 0.0004 0.0007 0.0011 0.0019 0.0033 0.0055 0.0094 0.0160 0.0272

Columns 45 through 51

0.0462 0.0785 0.1334 0.2269 0.3857 0.6556 1.1145