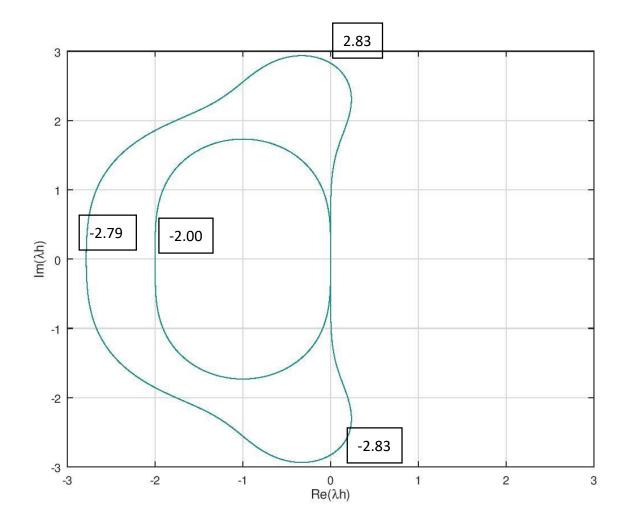
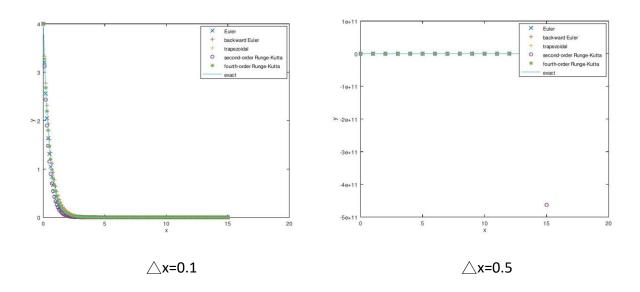
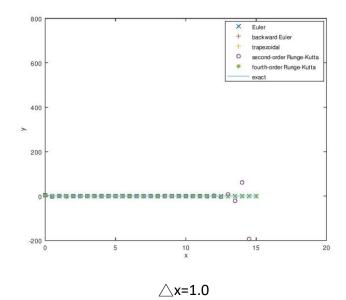
```
a.
                                                                               b.
clear
                                                                               n1=0.1;
clc
                                                                               x1=0:n1:15;
a=[];
                                                                               euler=backeuler=trap=rknd=rkth=[];
                                                                               euler(1)=backeuler(1)=trap(1)=rknd(1)=rkth(1)=4;
xv=linspace(-3,3,100);
yv=linspace(-3,3,100);
                                                                               %%%%Euler
[x,y]=meshgrid(xv,yv);
                                                                               for i=2:length(x1)
                                                                                     euler(i)=euler(i-1).*(1-n1*(2+0.01*(x1(i)).^2));
z=x+i*y;
                                                                               end
g=1+z+1/2*z.^2;
                                                                               %%%%backward Euler
gmag=abs(g);
g4=1+z+z.^2/2+z.^3/6+z.^4
                                                                               for i=1:(length(x1)-1)
/24;
                                                                                      backeuler(i+1)=backeuler(i).*(1/(1+n1*(2+0.01*(x1(i)).^2)));
gmag4=abs(g4);
                                                                               end
                                                                               %%%%trapezoidal
contour(x,y,gmag,[1 1]);
                                                                               for i=2:length(x1)
                                                                                     trap(i)=trap(i-1).*(1-
hold on;
                                                                               n1*(2+0.01*(x1(i)).^2)/2)./(1+n1*(2+0.01*(x1(i)).^2)/2);
contour(x,y,gmag4,[1 1]);
                                                                               end
axis([-3,3,-3,3]);
xlabel('Re(\lambdah)');
                                                                               %%%second RK
ylabel('Im(\lambdah)');
                                                                               for i=2:length(x1)
                                                                                      rknd(i)=rknd(i-1).*(1-n1*(2+0.01*(x1(i)).^2)-
grid on;
                                                                               (n1*(2+0.01*(x1(i)).^2))^2/2);
                                                                               end
                                                                               %%%forth RK
                                                                               for i=2:length(x1)
                                                                                      rkth(i)=rkth(i-1).*(1+(-n1*(2+0.01*(x1(i)).^2))+(-n1*(2+0.01*(x1(i)).^2))+(-n1*(2+0.01*(x1(i)).^2))+(-n1*(2+0.01*(x1(i)).^2))+(-n1*(2+0.01*(x1(i)).^2))+(-n1*(2+0.01*(x1(i)).^2))+(-n1*(2+0.01*(x1(i)).^2))+(-n1*(2+0.01*(x1(i)).^2))+(-n1*(2+0.01*(x1(i)).^2))+(-n1*(2+0.01*(x1(i)).^2))+(-n1*(2+0.01*(x1(i)).^2))+(-n1*(2+0.01*(x1(i)).^2))+(-n1*(2+0.01*(x1(i)).^2))+(-n1*(2+0.01*(x1(i)).^2))+(-n1*(x1(i)).^2))+(-n1*(x1(i)).^2)+(-n1*(x1(i)).^2)+(-n1*(x1(i)).^2)+(-n1*(x1(i)).^2)+(-n1*(x1(i)).^2)+(-n1*(x1(i)).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i))).^2)+(-n1*(x1(i)))+(-n1*(x1(i))).^2)+(-n1*(x1(i)))+(-n1*(x1(i)))+(-
                                                                               n1*(2+0.01*(x1(i)).^2)).^2/2+(-n1*(2+0.01*(x1(i)).^2)).^3/6+(-
                                                                               n1*(2+0.01*(x1(i)).^2)).^4/24);
                                                                               end
                                                                               x=linspace(0,15);
                                                                               y=4*(exp(-2*x-(0.01/3)*x.^3));
                                                                               plot(x1,euler,'x',x1,backeuler,'@',x1,trap,'+',x1,rknd,'o',x1,rkth,'*',x,y);
                                                                               legend('Euler', 'backward Euler', 'trapezoidal', 'second-order Runge-
                                                                               Kutta','fourth-order Runge-Kutta','exact');
                                                                               xlabel("x");
                                                                               ylabel("y");
```

c.1	c.2	
clear	clear	for j=3:5
clc	clc	f1test(j)=f1test(j-1)+((f1test(j-
		1)-f1test(j-2))/(f2test(j-1)-
h=0.01;	h=0.01;	f2test(j-2)))*(1-f2test(j-1));
f1=f2=f3=k1=k2=k3=k4=[];	f1=f2=f3=k1=k2=k3=k4=[];	f1(1)=f1test(j);
f2(1)=f3(1)=0;	f2(1)=f3(1)=0;	for i=1:1000
f1test=linspace(0.1,1,(1-	f1test(1)=1;	k1=h.*[-
0.1)/0.005+1);	f1test(2)=0.5;	f1(i).*f3(i),f1(i),f2(i)];
		k2=h.*[-
for j=1:length(f1test)	for j=1:2	(f1(i)+1/2*k1(1)).*(f3(i)+1/2*k1(3
f1(1)=f1test(j);	f1(1)=f1test(j);)),(f1(i)+1/2*k1(1)),(f2(i)+1/2*k1(
for i=1:1000	for i=1:1000	2))];
k1=h.*[-	k1=h.*[-f1(i).*f3(i),f1(i),f2(i)];	k3=h.*[-
f1(i).*f3(i),f1(i),f2(i)];	k2=h.*[-	(f1(i)+1/2*k2(1)).*(f3(i)+1/2*k2(3
k2=h.*[-	(f1(i)+1/2*k1(1)).*(f3(i)+1/2*k1(3)),(f1)),(f1(i)+1/2*k2(1)),(f2(i)+1/2*k2(
(f1(i)+1/2*k1(1)).*(f3(i)+1/2	(i)+1/2*k1(1)),(f2(i)+1/2*k1(2))];	2))];
*k1(3)),(f1(i)+1/2*k1(1)),(f2	k3=h.*[-	k4=h.*[-
(i)+1/2*k1(2))];	(f1(i)+1/2*k2(1)).*(f3(i)+1/2*k2(3)),(f1	(f1(i)+k3(1)).*(f3(i)+k3(3)),(f1(i)+k
k3=h.*[-	(i)+1/2*k2(1)),(f2(i)+1/2*k2(2))];	3(1)),(f2(i)+k3(2))];
(f1(i)+1/2*k2(1)).*(f3(i)+1/2	k4=h.*[-	
*k2(3)),(f1(i)+1/2*k2(1)),(f2	(f1(i)+k3(1)).*(f3(i)+k3(3)),(f1(i)+k3(1)),	
(i)+1/2*k2(2))];	(f2(i)+k3(2))];	f1(i+1)=f1(i)+1/6*k1(1)+1/3*(k2(
k4=h.*[-		1)+k3(1))+1/6*k4(1);
(f1(i)+k3(1)).*(f3(i)+k3(3)),(f		
1(i)+k3(1)),(f2(i)+k3(2))];	f1(i+1)=f1(i)+1/6*k1(1)+1/3*(k2(1)+k3	f2(i+1)=f2(i)+1/6*k1(2)+1/3*(k2(
	(1))+1/6*k4(1);	2)+k3(2))+1/6*k4(2);
fa (: . a) fa (:) . a (C*1.a (a) . a (2	f2/: .4\ f2/:\.4 /C*I.4/2\.4 /2*/I.2/2\.I.2	fa/: .4\ fa/:\.4 /c*l.4/a\.4 /a*/l.a/
f1(i+1)=f1(i)+1/6*k1(1)+1/3	f2(i+1)=f2(i)+1/6*k1(2)+1/3*(k2(2)+k3	f3(i+1)=f3(i)+1/6*k1(3)+1/3*(k2(
*(k2(1)+k3(1))+1/6*k4(1);	(2))+1/6*k4(2);	3)+k3(3))+1/6*k4(3); endfor
f2(i+1)=f2(i)+1/6*k1(2)+1/3	f3(i+1)=f3(i)+1/6*k1(3)+1/3*(k2(3)+k3	f2test(j)=f2(1001);
*(k2(2)+k3(2))+1/6*k4(2);	(3))+1/6*k4(3);	endfor
(2/: 4) (2/:) 4 (6*14/2) 4 (2	end	1:(0.40.4004)
f3(i+1)=f3(i)+1/6*k1(3)+1/3	f2test(j)=f2(1001);	e=linspace(0,10,1001);
*(k2(3)+k3(3))+1/6*k4(3);	end	plot(e,f1,e,f2,e,f3);
end		ylahal/lyl).
f2test(j)=f2(1001);		xlabel('x');
end		legend("f"","f"","f");
plot(f1test,f2test);		

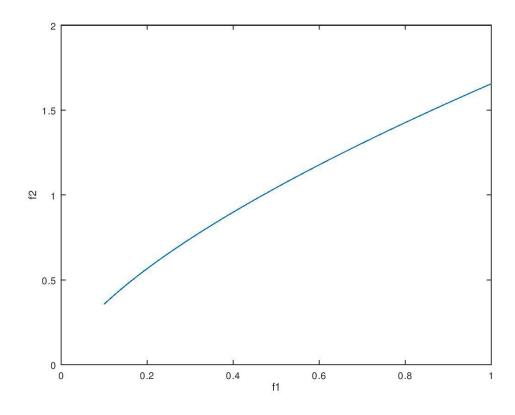


B.1





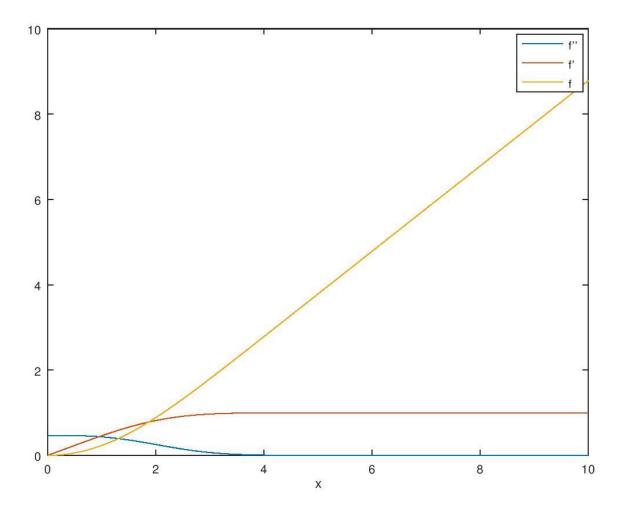
B.2



f2= Columns 73 through 84:

f1= Columns 73 through 84:

0.46000 0.46500 0.47000 0.47500 0.48000 0.48500 0.49000 0.49500 0.50000 0.50500 0.51500



How many iterations (α =?) are used to find an 'accepted' value of f1(0) which is good to 5 decimal points?

Ans: 3

What is this 'accepted' value of f1(0)?

Ans: f1test =

1.00000 0.50000 0.46514 0.46965 0.46960