```
clc, clear, close all
syms a x

% %% f1
% f = a*x^2 - 2*(a+1)*x + 3*a - 1
% df = diff(f, x)
% r = solve(f, x)
%
% a_bifurc = (solve((r(1,1)-r(2,1))))
%
%
% sr = subs(df, x, r)
% df_m = subs(sr, a, -0.2)
% df_p = subs(sr, a, 0.25)
%
% sr_m = subs(r, a, -0.15)
% sr_p = subs(r, a, 0.25)
%
% figure(1)
% hold on
%
% fplot(r(1,1))
% fplot(r(2,1))
%
% plot(-0.15,sr_m(1,1), "square", "color", 'k', 'MarkerSize',10)
% plot(-0.15,sr_m(2,1), "o", "color", 'k', 'MarkerSize',10)
% plot(0.25,sr_p(1,1), "square", "color", 'k', 'MarkerSize',10)
% plot(0.25,sr_p(2,1), "o", "color", 'k', 'MarkerSize',10)
% annotation('arrow',[0.237 0.237],[0.29 0.7])
% annotation('arrow',[0.36 0.36],[0.29 0.7])
% xlim([-0.5 2])
% ylim([-40 40])
% grid on
% xlabel('a')
% ylabel('x')
% legend('неустойчиво','устойчиво','C.P.1','C.P.1','C.P.2','C.P.2')
% hold off
```

```
%f2
f = (a-1)*9^x - 2*a*3^x + 2*a + 2
```

f = $2\,a-2\,3^x\,a+9^x\,(a-1)+2$

```
df = (diff(f, x))
```

df = $9^x\log(9)\,(a-1)-2\,3^x\,a\log(3)$

```
r = simplify(solve(f, x))
```

r =

$$\begin{pmatrix} \frac{\log\left(\frac{a-\sqrt{2-a^2}}{a-1}\right)}{\log(3)} \\ \frac{\log\left(\frac{a+\sqrt{2-a^2}}{a-1}\right)}{\log(3)} \end{pmatrix}$$

```
rr = (r(1,1)-r(2,1))
```

rr =

$$\frac{\log\left(\frac{a-\sqrt{2-a^2}}{a-1}\right)}{\log(3)} - \frac{\log\left(\frac{a+\sqrt{2-a^2}}{a-1}\right)}{\log(3)}$$

```
a_bifurc = solve(rr)
```

a_bifurc =

$$\begin{pmatrix} \sqrt{2} \\ -\sqrt{2} \end{pmatrix}$$

```
sr = subs(df, x, r);
df_m = eval((subs(sr, a, -1.25)))
```

```
df_m = 2×1
   -1.2346
    0.3802
```

```
df_p = eval((subs(sr, a, 1.25)))
```

```
df_p = 2×1
   -3.4215
   11.1118
```

```
df_0 = eval((subs(sr, a, 0)))
```

```
df_0 = 2×1 complex
  -4.3944 + 0.0000i
  -4.3944 - 0.0000i
```

```
sr_m = eval(subs(r, a, -1.25))
```

```
sr_m = 2×1
   -0.1484
   -1.2206
```

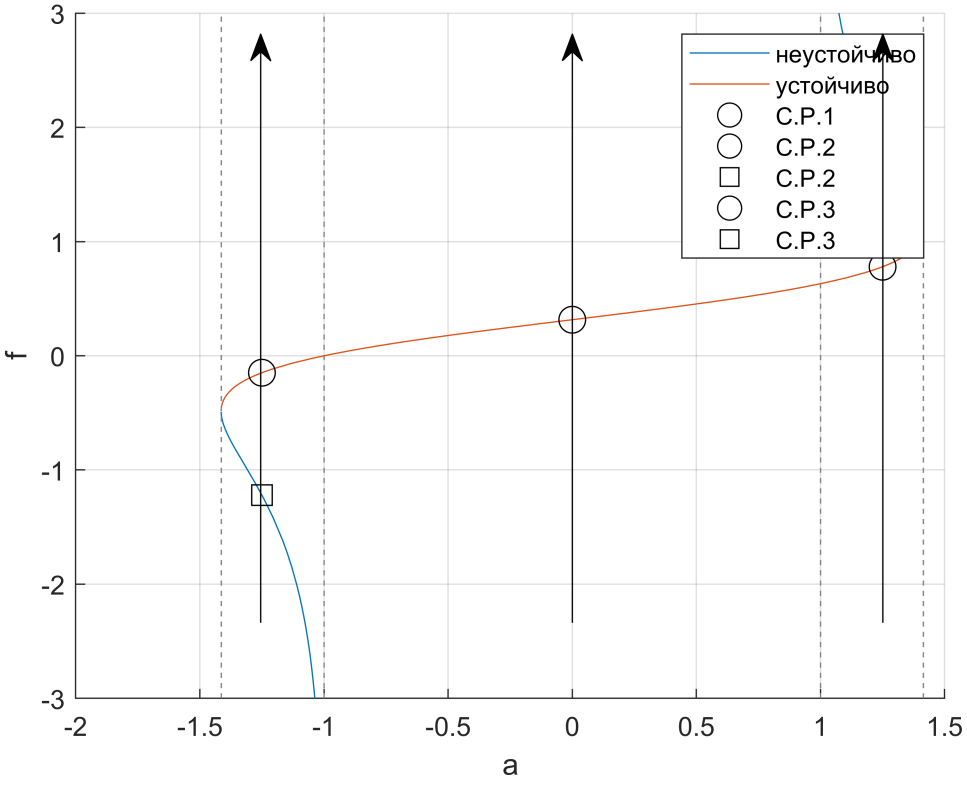
```
sr_p = eval(subs(r, a, 1.25))
```

```
sr_p = 2×1
    0.7794
    1.8516
```

```
sr_0 = eval(subs(r, a, 0))
```

```
sr_0 = 2×1 complex
   0.3155 + 0.0000i
   0.3155 + 2.8596i
```

```
figure(2)
hold on
fplot(r(2,1))
fplot(r(1,1))



plot(0,sr_0(1,1), "o", "color", 'k', 'MarkerSize',10)

plot(-1.25,sr_m(1,1), "o", "color", 'k', 'MarkerSize',10)
plot(-1.25,sr_m(2,1), "square", "color", 'k', 'MarkerSize',10)

plot(1.25,sr_p(1,1), "o", "color", 'k', 'MarkerSize',10)
plot(1.25,sr_p(2,1), "square", "color", 'k', 'MarkerSize',10)

annotation('arrow',[0.295 0.295],[0.2 0.9])
annotation('arrow',[0.573 0.573],[0.2 0.9])
annotation('arrow',[0.85 0.85],[0.2 0.9])

legend('неустойчиво','устойчиво','C.P.1','C.P.2','C.P.2','C.P.3','C.P.3')
xlim([-2 1.5])
ylim([-3 3])
grid on
xlabel('a')
ylabel('f')
hold off
```


неустойчиво
устойчиво
С.Р.1
С.Р.2
С.Р.2
С.Р.3
С.Р.3
f
a
3
2
1
0
-1
-2
-3
-2
-1.5
-1
-0.5
0
0.5
1
1.5