```
format long;
```

Problema 1. Conditionarea radacinilor ecuatiei de grad 2.

```
cond_quad(1, 1.999, 1)
```

```
ans =
  47.424281920010728
```

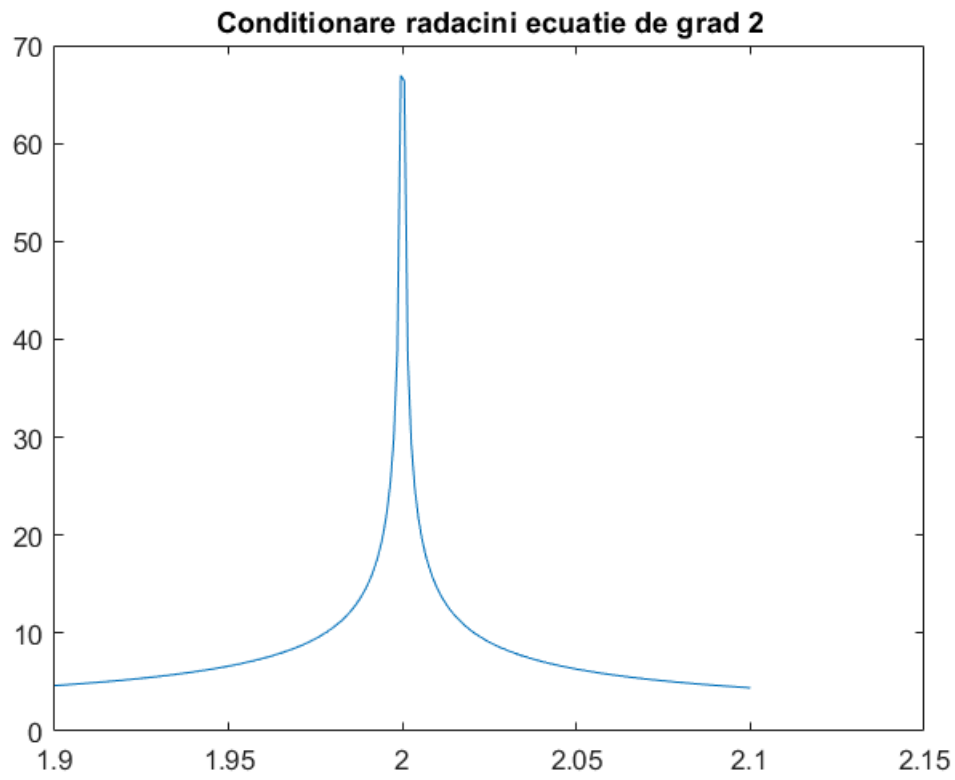
```
cond_quad(0.999, 2, 1)
```

```
ans =
  46.934164902523555
```

```
a = 1;
c = 1;
b_vals = linspace(1.9, 2.1, 200);
conds = zeros(size(b_vals));

for i = 1:length(b_vals)
    b = b_vals(i);
    conds(i) = cond_quad(a, b, c);
end

plot(b_vals, conds);
title('Conditionare radacini ecuatie de grad 2');
```



Alta incercare, simbolica

```
c = cond_quad_sym()
```

c =

$$\left(\frac{2\,|b|+\sigma_3}{2\,\sigma_1}+\frac{2\,|a|\,|c|}{\sigma_1\,\sigma_3}\quad\frac{\sigma_2+2\,|b|}{2\,\sigma_1}+\frac{2\,|a|\,|c|}{\sigma_2\,\sigma_1}\right)$$

where

$$\sigma_1 = \sqrt{|b^2-4\,a\,c|}$$

$$\sigma_2 = |\sqrt{b^2-4\,a\,c}-b|$$

$$\sigma_3 = |b+\sqrt{b^2-4\,a\,c}|$$

```
% Evaluare a expresiei de mai sus
cond_quad_eval(1, 1.999, 1)
```

```
ans = 1×2
  63.237647015054101  63.237647015054101
```

```
cond_quad_eval(0.999, 2, 1)
```

```
ans = 1×2
  63.245553203367564  63.245553203367564
```

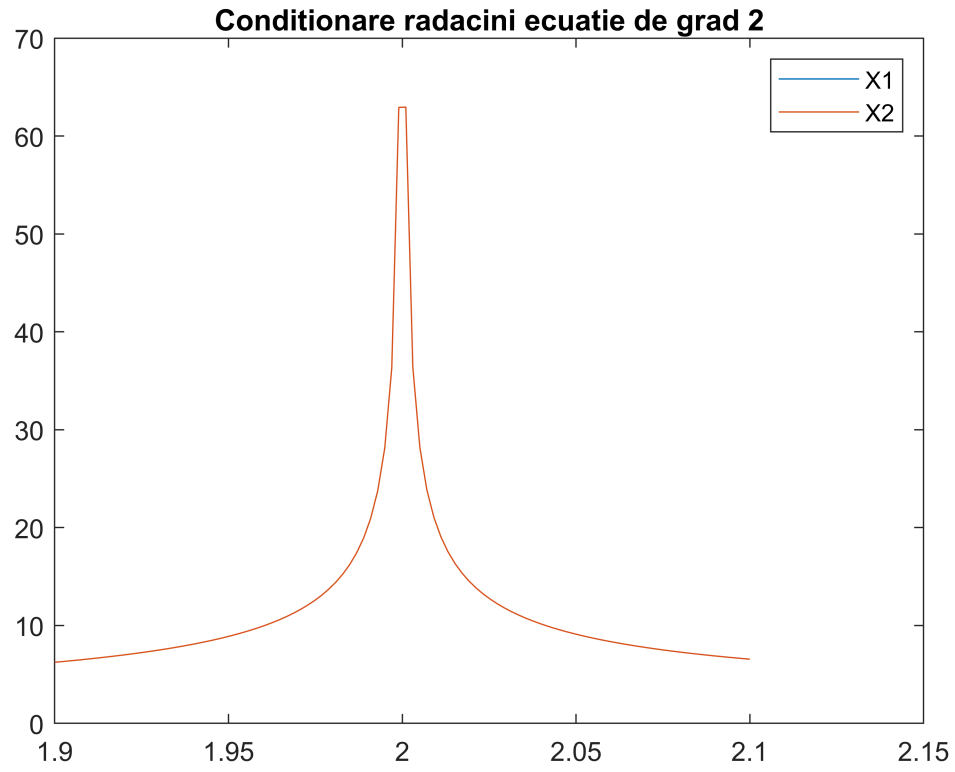
```
cond_quad_eval(1, 1e8, 1)
```

```
ans = 1×2
   2.000000000000000   2.342177280000000
```

```
a = 1;
c = 1;
b_vals = linspace(1.9, 2.1, 100);
conds1 = zeros(size(b_vals));
conds2 = zeros(size(b_vals));

for i = 1:length(b_vals)
    b = b_vals(i);
    cr = cond_quad_eval(a, b, c);
    conds1(i) = cr(1);
    conds2(i) = cr(2);
end
```

```
plot(b_vals, conds1, b_vals, conds2);
title('Conditionare radacini ecuatie de grad 2');
legend('X1', 'X2');
```



Problema 2. Rutina de rezolvare a ecuatiei de grad 2.

```
% Caz normal
rt = stable_quadratic_solver(2, 5, 2);
r1 = [rt(2) ; rt(1)]
```

```
r1 = 2×1
  -2.000000000000000
  -0.500000000000000
```

```
r2 = roots([2, 5, 2])
```

```
r2 = 2×1
  -2.000000000000000
  -0.500000000000000
```

```
err = norm(r1 - r2) / norm(r2)
```

```
err =
     0
```

```
% Caz in care b^2 aprox. egal cu 4*a*c
```

```
rt = stable_quadratic_solver(2 - 1e-10, 4, 2);
r1 = [rt(2) ; rt(1)]
```

```
r1 = 2×1
  -1.000007071118105
  -0.999992928981895
```

```
r2 = roots([2 - 1e-10, 4, 2])
```

```
r2 = 2×1
  -1.000007071118105
  -0.999992928981895
```

```
err = norm(r1 - r2) / norm(r2)
```

```
err =
     1.755416734156694e-16
```

```
rt = stable_quadratic_solver(vpa(1) - vpa(1e-16), 1, 1/4); % 1 - 1e-16 simplu isi pierde preciz
r1 = [eval(rt(2)); eval(rt(1))]
```

```
r1 = 2×1
  -0.500000000000000
  -0.500000000000000
```

```
r2 = roots([1 - 1e-16, 1, 1/4])
```

```
r2 = 2×1
  -0.500000000000000
  -0.500000000000000
```

```
err = (norm(r1 - r2) / norm(r2))
```

```
err =
     0
```

```
% Caz in care b^2 >> 4*a*c si b > 0
rt = stable_quadratic_solver(2, 1e8, 3);
r1 = [rt(2) ; rt(1)]
```

```
r1 = 2×1
10^7 ×
  -4.999999999999997
  -0.000000000000003
```

```
r2 = roots([2, 1e8, 3])
```

```
r2 = 2×1
10^7 ×
  -4.999999999999997
  -0.000000000000003
```

```
err = norm(r1 - r2) / norm(r2)
```

```
err =
     0
```

```
% Caz in care b^2 >> 4*a*c si b < 0
rt = stable_quadratic_solver(2, -1e8, 3);
r1 = rt'
```

```
r1 = 2×1
10^7 ×
   4.999999999999997
   0.000000000000003
```

```
r2 = roots([2, -1e8, 3])
```

```
r2 = 2×1
10^7 ×
   4.999999999999997
   0.000000000000003
```

```


err = norm(r1 - r2) / norm(r2)
```

```
err =
     0
```

```
% Posibila depasire la calculul discriminantului
rt = stable_quadratic_solver(1e150, 3e200, 1e250);
r1 = [rt(2) ; rt(1)]
```

```
r1 = 2×1
10^50 ×
  -2.618033988749894
  -0.381966011250105
```

```
r2 = roots([1e150, 3e200, 1e250])
```

```
r2 = 2×1
10^50 ×
  -2.618033988749894
  -0.381966011250105
```

```


err = norm(r1 - r2) / norm(r2)
```

```
err =
     1.962503745843583e-17
```