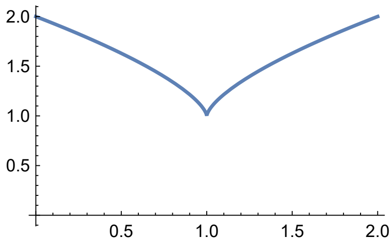
Vježbe 5. Minimizacija strogo kvazikonveksnih funkcija

Metoda ogradivanja

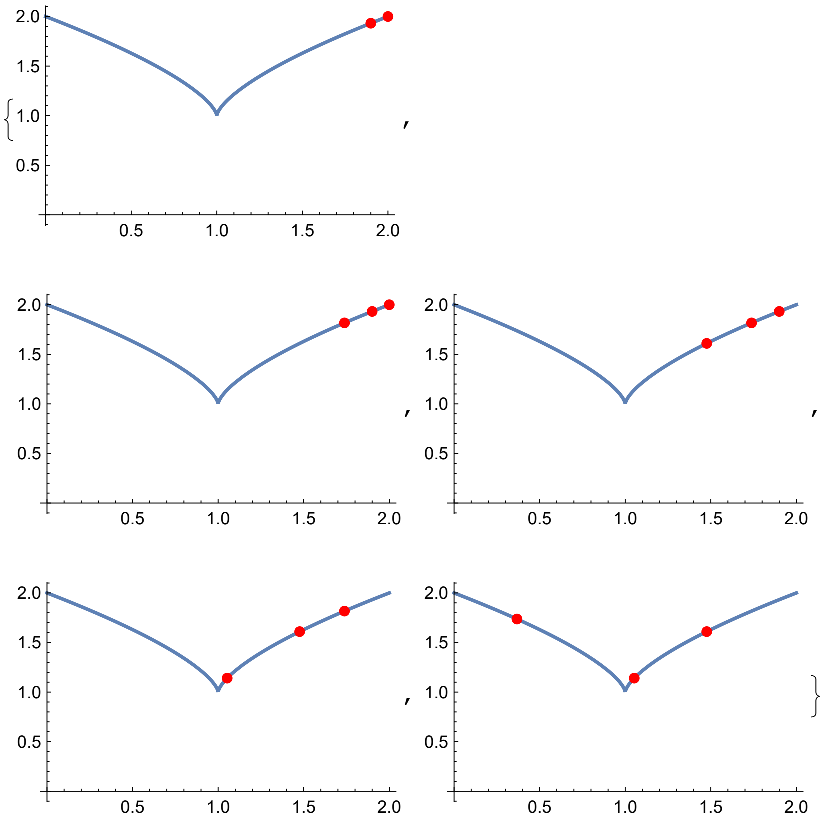
Primjer 1.

```
f[x_] := 1 + ((x - 1) ^2) ^ (1 / 3) ;  a = 0; b = 2;
slf = Plot[f[x], {x, a, b}, AxesOrigin → {0, 0},
  PlotStyle → {Thickness[.01]}, ImageSize → 200]
```




```
xp = 2.;
print = 1; (* Ako je print=1, printat ce se medjukoraci *)
k = 1; rho = 1/2 (1 + √5); eps = 0.1; x = {xp};
If[f[x[[1]] + eps] < f[x[[1]]], AppendTo[x, x[[1]] + eps]];
If[f[x[[1]] - eps] < f[x[[1]]], AppendTo[x, x[[1]] - eps]];
sliter = {Show[
    {slf, ListPlot[Transpose[{x, f[x]}], PlotStyle → {Red, PointSize[0.03]}]}]};
While[f[x[[k + 1]]] < f[x[[k]]],
  k = k + 1;
  AppendTo[x, x[[k]] + rho (x[[k]] - x[[k - 1]])];
  AppendTo[sliter,
   Show[{slf, ListPlot[Transpose[{Take[x, -3], f[Take[x, -3]]}],
      PlotStyle → {Red, PointSize[0.03]}]}]];
  If[print == 1, Print[{k + 1, Transpose[{Take[x, -3], f[Take[x, -3]]}]}]];
 ];
a = Min[x[[k - 1]], x[[k + 1]]]; b = Max[x[[k - 1]], x[[k + 1]]];
Print["Izabrani interval: ", {a, b}]
sliter
```

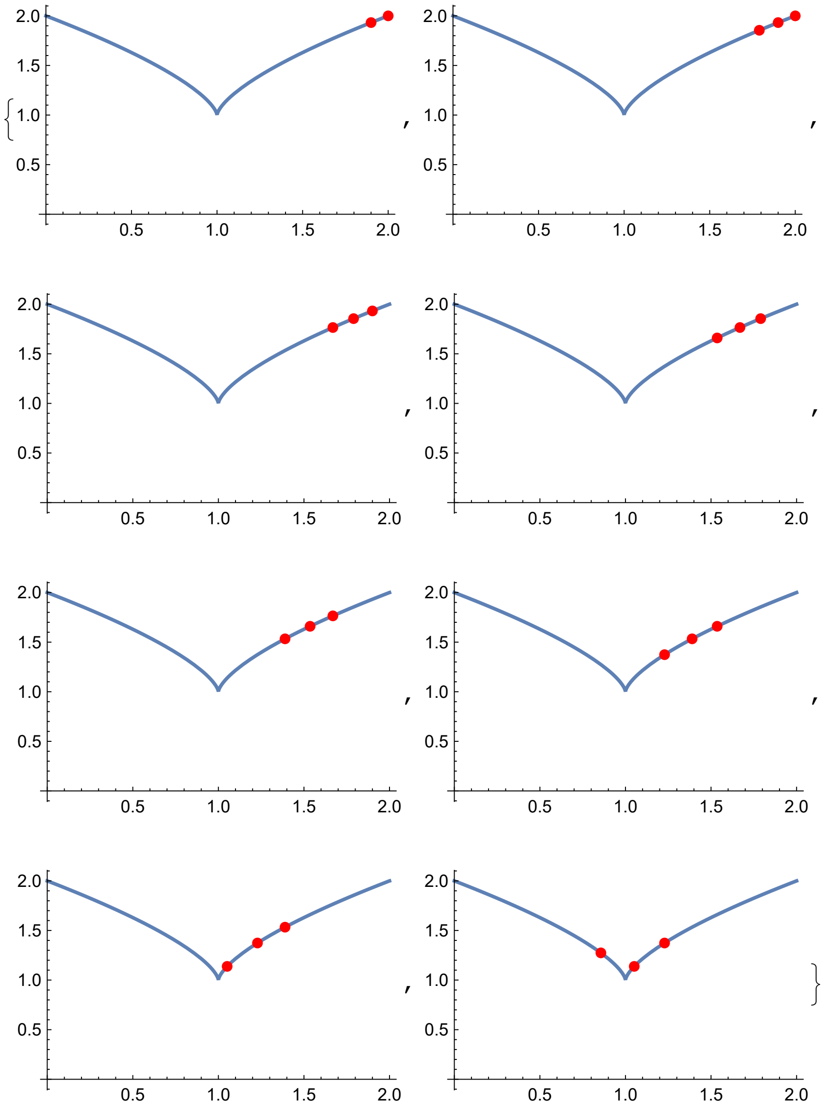
```
{3, {{2., 2.}, {1.9, 1.93217}, {1.7382, 1.8168}}}

{4, {{1.9, 1.93217}, {1.7382, 1.8168}, {1.47639, 1.60997}}}

{5, {{1.7382, 1.8168}, {1.47639, 1.60997}, {1.05279, 1.14072}}}

{6, {{1.47639, 1.60997}, {1.05279, 1.14072}, {0.367376, 1.73694}}}

Izabrani interval: {0.367376, 1.47639}
```



Primjer za rho = 1.1

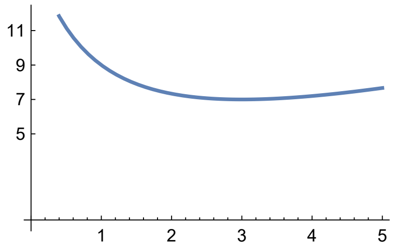
```
xp = 2.;
print = 1; (* Ako je print=1, printat ce se medjukoraci *)
k = 1; rho = 1.1; eps = 0.1; x = {xp};
If[f[x[[1]] + eps] < f[x[[1]]], AppendTo[x, x[[1]] + eps]];
If[f[x[[1]] - eps] < f[x[[1]]], AppendTo[x, x[[1]] - eps]];
sliter = {Show[
    {slf, ListPlot[Transpose[{x, f[x]}], PlotStyle → {Red, PointSize[0.03]}]}]};
While[f[x[[k + 1]]] < f[x[[k]]],
  k = k + 1;
  AppendTo[x, x[[k]] + rho (x[[k]] - x[[k - 1]])];
  AppendTo[sliter,
   Show[{slf, ListPlot[Transpose[{Take[x, -3], f[Take[x, -3]]}],
      PlotStyle → {Red, PointSize[0.03]}]}]];
  If[print == 1, Print[{k + 1, Transpose[{Take[x, -3], f[Take[x, -3]]}]}]];
 ];
a = Min[x[[k - 1]], x[[k + 1]]]; b = Max[x[[k - 1]], x[[k + 1]]];
Print["Izabrani interval: ", {a, b}]
sliter
```

```
{3, {{2., 2.}, {1.9, 1.93217}, {1.79, 1.85458}}}
{4, {{1.9, 1.93217}, {1.79, 1.85458}, {1.669, 1.76492}}}
{5, {{1.79, 1.85458}, {1.669, 1.76492}, {1.5359, 1.65976}}}
{6, {{1.669, 1.76492}, {1.5359, 1.65976}, {1.38949, 1.53333}}}
{7, {{1.5359, 1.65976}, {1.38949, 1.53333}, {1.22844, 1.37369}}}
{8, {{1.38949, 1.53333}, {1.22844, 1.37369}, {1.05128, 1.13803}}}
{9, {{1.22844, 1.37369}, {1.05128, 1.13803}, {0.856411, 1.27421}}}
Izabrani interval: {0.856411, 1.22844}
```



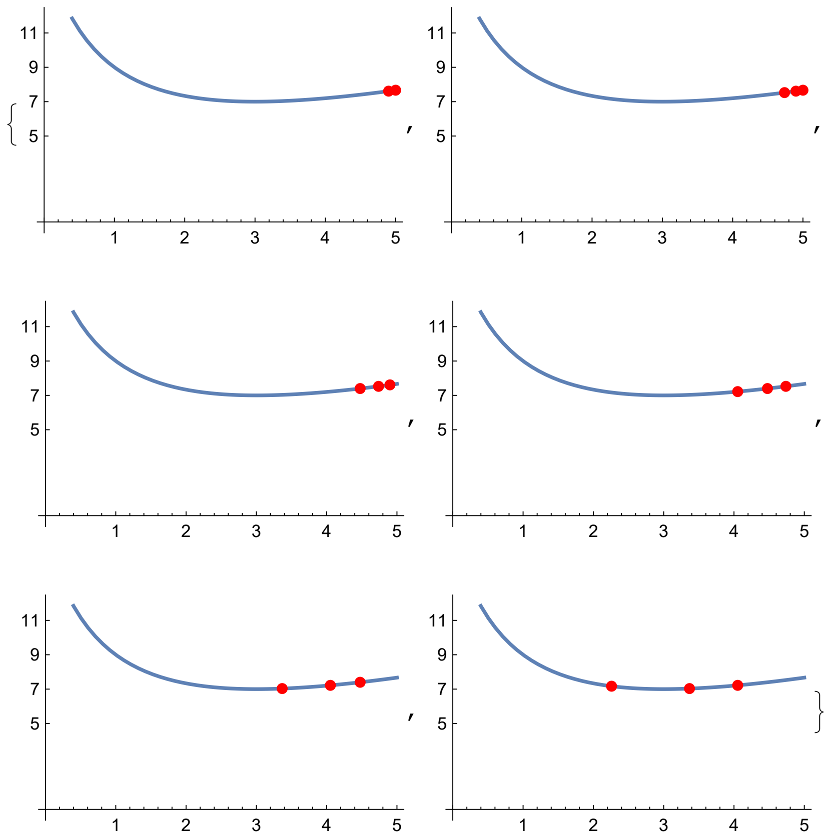
Primjer 2.

```
f[x_] := x + 16 / (x + 1); a = 0; b = 5;
slf = Plot[f[x], {x, a, b}, AxesOrigin → {0, 0}, PlotStyle → {Thickness[.01]},
  Ticks → {Automatic, {5, 7, 9, 11}}, ImageSize → 200]
```




```
xp = 5.;
print = 1; (* Ako je print=1, printat ce se medjukoraci *)
k = 1; rho = 1/2 (1 + √5); eps = .1; x = {xp};
If[f[x[[1]] + eps] < f[x[[1]]], AppendTo[x, x[[1]] + eps]];
If[f[x[[1]] - eps] < f[x[[1]]], AppendTo[x, x[[1]] - eps]];
sliter = {Show[
    {slf, ListPlot[Transpose[{x, f[x]}], PlotStyle → {Red, PointSize[0.03]}]}]};
While[f[x[[k + 1]]] < f[x[[k]]],
  k = k + 1;
  AppendTo[x, x[[k]] + rho (x[[k]] - x[[k - 1]])];
  AppendTo[sliter,
   Show[{slf, ListPlot[Transpose[{Take[x, -3], f[Take[x, -3]]}],
      PlotStyle → {Red, PointSize[0.03]}]}]];
  If[print == 1, Print[{k + 1, Transpose[{Take[x, -3], f[Take[x, -3]]}]}]];
 ];
a = Min[x[[k - 1]], x[[k + 1]]]; b = Max[x[[k - 1]], x[[k + 1]]];
Print["Izabrani interval: ", {a, b}]
sliter
```

```
{3, {{5., 7.66667}, {4.9, 7.61186}, {4.7382, 7.52653}}}
{4, {{4.9, 7.61186}, {4.7382, 7.52653}, {4.47639, 7.39802}}}
{5, {{4.7382, 7.52653}, {4.47639, 7.39802}, {4.05279, 7.21936}}}
{6, {{4.47639, 7.39802}, {4.05279, 7.21936}, {3.36738, 7.0309}}}
{7, {{4.05279, 7.21936}, {3.36738, 7.0309}, {2.25836, 7.16881}}}
Izabrani interval: {2.25836, 4.05279}
```

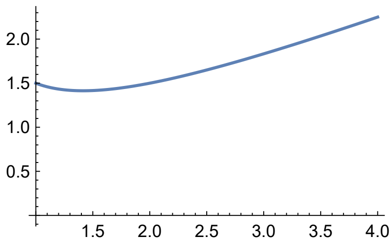


Metoda polovljenja za konveksnu diferencijabilnu funkciju

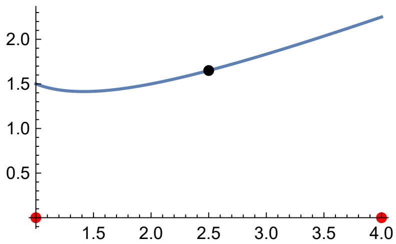
Primjer 1.

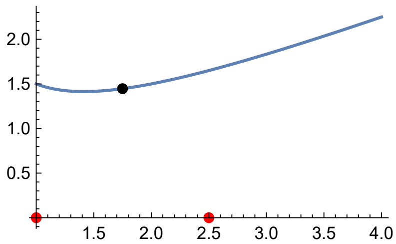
```
f[x_] := x / 2 + 1 / x
a = 1.; b = 4.;  xz = Sqrt[2];
(*Potreban broj iteracija*)
eps = 0.00005;
(Log[eps] - Log[b - a]) / Log[0.5] - 1
n = 15;

sl1 = Plot[f[x], {x, a, b}, AxesOrigin → {1, 0}, ImageSize → 200]
xa = Table[0, {i, n + 1}]; (*aproksimacije*)
sl = Table[0, {i, n + 1}];
Do[
 xa[[i]] = (a + b) / 2;
 Print[i - 1, "     ak=", a, "    bk=", b, "     Aproksimacija: ",
  xa[[i]], "     f'(xk)=", f'[xa[[i]]], "        Pogreska: ",
  Abs[xa[[i]] - xz], "  Ocjena pogreske: ", 0.5^(i) * (4 - 1)];
 sl[[i]] = Show[{sl1, Graphics[{PointSize[.03],
       Point[{{xa[[i]], f[xa[[i]]]}}], Red, Point[{{a, 0}, {b, 0}}]}]}];
 If[f'[xa[[i]]] > 0, b = xa[[i]], a = xa[[i]]];
 , {i, n + 1}]
GraphicsRow[sl]
sl;
```

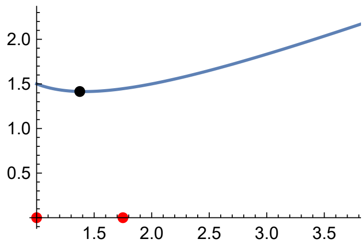
```
14.8727
```



```
0    ak=1.   bk=4.    Aproksimacija: 2.5
     f'(xk)=0.34       Pogreska: 1.08579  Ocjena pogreske: 1.5

1    ak=1.   bk=2.5    Aproksimacija: 1.75    f'(xk)=
 0.173469       Pogreska: 0.335786  Ocjena pogreske: 0.75

2    ak=1.   bk=1.75    Aproksimacija: 1.375    f'(xk)=
 -0.0289256       Pogreska: 0.0392136  Ocjena pogreske: 0.375

3    ak=1.375   bk=1.75    Aproksimacija: 1.5625
     f'(xk)=0.0904       Pogreska: 0.148286  Ocjena pogreske: 0.1875

4    ak=1.375   bk=1.5625    Aproksimacija: 1.46875    f'(xk)=
 0.0364418       Pogreska: 0.0545364  Ocjena pogreske: 0.09375

5    ak=1.375   bk=1.46875    Aproksimacija: 1.42188    f'(xk)=
 0.00537375       Pogreska: 0.00766144  Ocjena pogreske: 0.046875

6    ak=1.375   bk=1.42188    Aproksimacija: 1.39844    f'(xk)=
 -0.0113448       Pogreska: 0.0157761  Ocjena pogreske: 0.0234375

7    ak=1.39844   bk=1.42188    Aproksimacija: 1.41016    f'(xk)=
 -0.00288135       Pogreska: 0.00405731  Ocjena pogreske: 0.0117188

8    ak=1.41016   bk=1.42188    Aproksimacija: 1.41602    f'(xk)=
 0.00127182       Pogreska: 0.00180206  Ocjena pogreske: 0.00585938

9    ak=1.41016   bk=1.41602    Aproksimacija: 1.41309    f'(xk)=
 -0.000798306       Pogreska: 0.00112762  Ocjena pogreske: 0.00292969

10    ak=1.41309   bk=1.41602    Aproksimacija: 1.41455    f'(xk)=
 0.000238364       Pogreska: 0.000337219  Ocjena pogreske: 0.00146484

11    ak=1.41309   bk=1.41455    Aproksimacija: 1.41382    f'(xk)=
 -0.000279568       Pogreska: 0.000395203  Ocjena pogreske: 0.000732422

12    ak=1.41382   bk=1.41455    Aproksimacija: 1.41418    f'(xk)=
 -0.0000205011       Pogreska: 0.0000289921  Ocjena pogreske: 0.000366211

13    ak=1.41418   bk=1.41455    Aproksimacija: 1.41437    f'(xk)=
 0.000108957       Pogreska: 0.000154113  Ocjena pogreske: 0.000183105

14    ak=1.41418   bk=1.41437    Aproksimacija: 1.41428    f'(xk)=
 0.0000442341       Pogreska: 0.0000625607  Ocjena pogreske: 0.0000915527

15    ak=1.41418   bk=1.41428    Aproksimacija: 1.41423    f'(xk)=
 0.0000118681       Pogreska: 0.0000167843  Ocjena pogreske: 0.0000457764
```







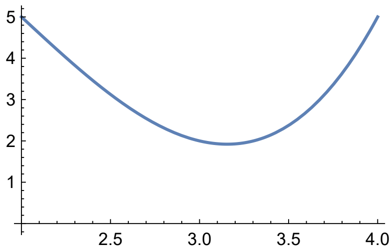

```
FindMinimum[f[x], {x, 1, 4}]
Clear[x];
Minimize[{f[x], 1 ≤ x ≤ 4}, x]
```

{1.41421, {x → 1.41421}}

$\{\sqrt{2}, \{x \to \sqrt{2}\}\}$

Primjer 2.

```
f[x_] := x^3 - 6 x^2 + 8 x + 5;
a = 2;
b = 4;  xz = x /. Minimize[{x^3 - 6 x^2 + 8 x + 5, 2 < x < 4}, x][[2]];
n = 5; (*rubne tocke intervala,
stvarno rješenje, tolerancija i broj iteracija*)
sl1 = Plot[f[x], {x, a, b}, AxesOrigin → {2, 0}, ImageSize → 200]
xa = Table[0, {i, n}]; (*aproksimacije*)
sl = Table[0, {i, n}];
Do[
 xa[[i]] = (a + b) / 2;
 Print[i, "    Aproksimacija: ", xa[[i]], "   Pogreska: ", Abs[xa[[i]] - xz]];
 sl[[i]] = Show[{sl1, Graphics[{PointSize[.03],
       Point[{{xa[[i]], f[xa[[i]]]}}], Red, Point[{{a, 0}, {b, 0}}]}]}];
 If[f'[xa[[i]]] > 0, b = xa[[i]], a = xa[[i]]];
 , {i, n}]
GraphicsRow[sl]
sl;
```



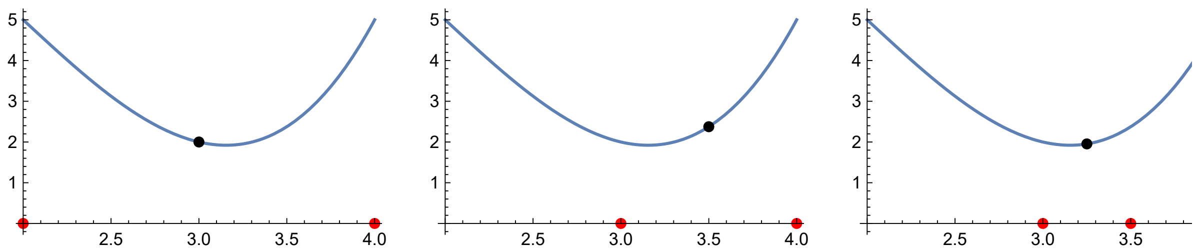
1 Aproksimacija: 3 Pogreska: $-3+\frac{1}{3}\left(6+2\sqrt{3}\right)$

2 Aproksimacija: $\frac{7}{2}$ Pogreska: $\frac{7}{2}+\frac{1}{3}\left(-6-2\sqrt{3}\right)$

3 Aproksimacija: $\frac{13}{4}$ Pogreska: $\frac{13}{4}+\frac{1}{3}\left(-6-2\sqrt{3}\right)$

4 Aproksimacija: $\frac{25}{8}$ Pogreska: $-\frac{25}{8}+\frac{1}{3}\left(6+2\sqrt{3}\right)$

5 Aproksimacija: $\frac{51}{16}$ Pogreska: $\frac{51}{16}+\frac{1}{3}\left(-6-2\sqrt{3}\right)$

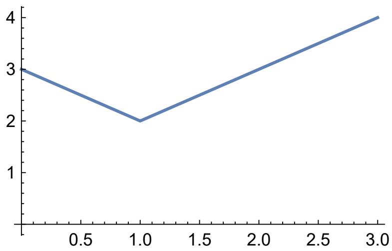


Metoda polovljenja za nediferencijabilnu strogo

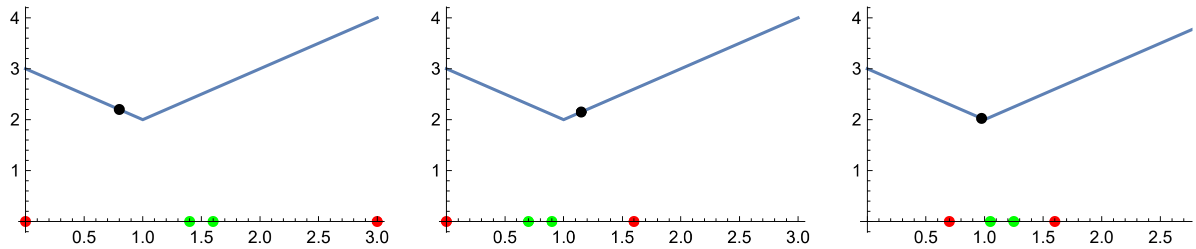
kvazikonveksnu funkciju

Primjer 1.

```
a = 0;
b = 3;  xz = 1;
delta = .2; n = 4; (*rubne tocke intervala,
stvarno rješenje, tolerancija i broj iteracija*)
f[x_] := Abs[x - 1] + 2
sl1 = Plot[f[x], {x, a, b}, AxesOrigin → {0, 0}, ImageSize → 200]
xa = Table[0, {i, n}]; (*aproksimacije*)
sl = Table[0, {i, n}];
Do[
 x1 = (a + b - delta) / 2;
 x2 = (a + b + delta) / 2;
 aprethodni = a;
 bprethodni = b;
 If[f[x1] ≤ f[x2], b = x2, a = x1];
 xa[[i]] = (a + b) / 2;
 Print[i, "  x1=", x1, "   x2=", x2, "  f(x1)=", f[x1], "   f(x2)=", f[x2],
  "     Aproksimacija: ", xa[[i]], "  Pogreska: ", Abs[xa[[i]] - xz]];
 sl[[i]] = Show[{sl1, Graphics[{PointSize[.03], Point[{{xa[[i]], f[xa[[i]]]}}],
      Red, Point[{{aprethodni, 0}, {bprethodni, 0}}],
      Green, Point[{{x1, 0}, {x2, 0}}]}]}];
 , {i, n}]
GraphicsRow[sl]
```



```
1  x1=1.4   x2=1.6  f(x1)=2.4   f(x2)=2.6     Aproksimacija: 0.8  Pogreska: 0.2

2  x1=0.7   x2=0.9  f(x1)=2.3   f(x2)=2.1     Aproksimacija: 1.15  Pogreska: 0.15

3  x1=1.05   x2=1.25  f(x1)=2.05   f(x2)=
 2.25     Aproksimacija: 0.975  Pogreska: 0.025

4  x1=0.875   x2=1.075  f(x1)=2.125   f(x2)=
 2.075     Aproksimacija: 1.0625  Pogreska: 0.0625
```



```
1 / 2^5 * 3 + 1 / 2 * (1 - 1 / 2^4) * delta
```

```
0.1875
```

```
(3 - 0.001) / (0.005 - 0.0005)
```

```
666.444
```

```
Log[666.444] / Log[2] - 1
```

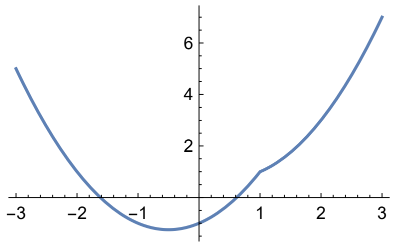
```
8.38034
```

```
(Log[0.005 - 1 / 2 * 0.001] - Log[3 - 0 - 0.001]) / Log[0.5] - 1
```

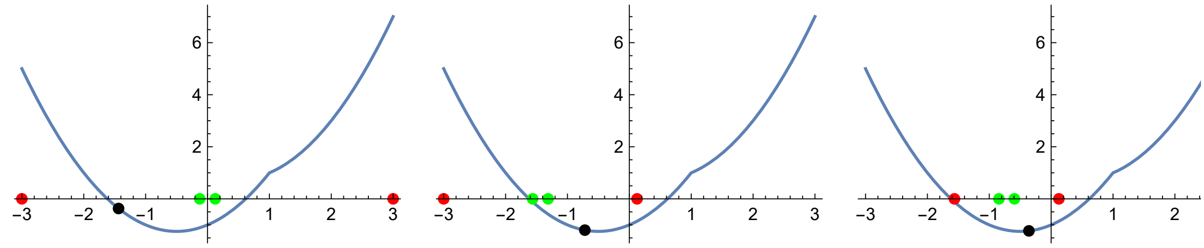
```
8.38034
```

Primjer 2.

```
a = -3;
b = 3;  xz = -0.5;
delta = .25; n = 5; (*rubne tocke intervala,
stvarno rješenje, tolerancija i broj iteracija*)
f[x_] := -Abs[1 - x] + x^2
sl1 = Plot[f[x], {x, a, b}, AxesOrigin → {0, 0}, ImageSize → 200]
xa = Table[0, {i, n}]; (*aproksimacije*)
sl = Table[0, {i, n}];
Do[
 x1 = (a + b - delta) / 2;
 x2 = (a + b + delta) / 2;
 aprethodni = a;
 bprethodni = b;
 If[f[x1] ≤ f[x2], b = x2, a = x1];
 xa[[i]] = (a + b) / 2;
 Print[i, "   x1=", x1, "    x2=", x2, "   f(x1)=", f[x1], "    f(x2)=", f[x2],
  "      Aproksimacija: ", xa[[i]], "  Pogreska: ", Abs[xa[[i]] - xz]];
 sl[[i]] = Show[{sl1, Graphics[{PointSize[.03], Point[{{xa[[i]], f[xa[[i]]]}}],
      Red, Point[{{aprethodni, 0}, {bprethodni, 0}}],
      Green, Point[{{x1, 0}, {x2, 0}}]}]}];
 , {i, n}]
GraphicsRow[sl]
```

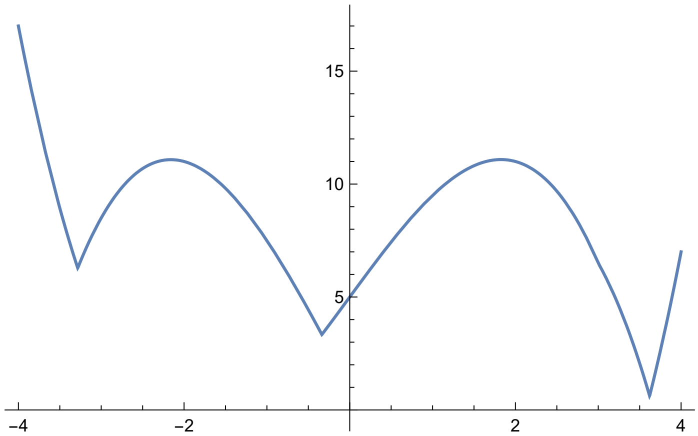


```
1  x1=-0.125   x2=0.125  f(x1)=-1.10938   f(x2)=
 -0.859375     Aproksimacija: -1.4375  Pogreska: 0.9375

2  x1=-1.5625   x2=-1.3125  f(x1)=-0.121094   f(x2)=
 -0.589844     Aproksimacija: -0.71875  Pogreska: 0.21875

3  x1=-0.84375   x2=-0.59375  f(x1)=-1.13184   f(x2)=
 -1.24121     Aproksimacija: -0.359375  Pogreska: 0.140625

4  x1=-0.484375   x2=-0.234375  f(x1)=-1.24976   f(x2)=
 -1.17944     Aproksimacija: -0.539063  Pogreska: 0.0390625

5  x1=-0.664063   x2=-0.414063  f(x1)=-1.22308   f(x2)=
 -1.24261     Aproksimacija: -0.449219  Pogreska: 0.0507813
```



Primjer 3.

```
a = -4; b = 4;  {x0, y0} = {3, 4}; q[x_] := .5 x^3 - 6 x + 2;
f[x_] := Abs[x - x0] + Abs[q[x] - y0];
sl1 = Plot[f[x], {x, a, b}, AxesOrigin → {0, 0}]
```

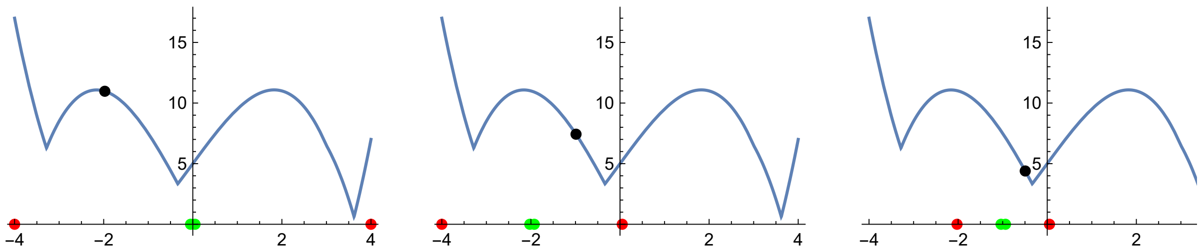


```
(* IZABERI PODINTERVAL *)
a = -4; b = 4;
min = FindMinimum[f[u], {u, 3}];
xz = u /. min[[2]];
Print["Minimum: ", xz]
delta = 0.1; n = 5;
xa = Table[0, {i, n}]; (*aproksimacije*)
sl = Table[0, {i, n}];
Do[
 x1 = (a + b - delta) / 2;
 x2 = (a + b + delta) / 2;
 aprethodni = a;
 bprethodni = b;
 If[f[x1] ≤ f[x2], b = x2, a = x1];
 xa[[i]] = (a + b) / 2;
 Print[i, "  x1=", x1, "   x2=", x2, "  f(x1)=", f[x1], "   f(x2)=", f[x2],
  "     Aproksimacija: ", xa[[i]], "  Pogreska: ", Abs[xa[[i]] - xz]];
 sl[[i]] = Show[{sl1, Graphics[{PointSize[.03], Point[{{xa[[i]], f[xa[[i]]]}}],
      Red, Point[{{aprethodni, 0}, {bprethodni, 0}}],
      Green, Point[{{x1, 0}, {x2, 0}}]}]}];
 , {i, n}]
GraphicsRow[sl]
```

FindMinimum::lstol :

The line search decreased the step size to within the tolerance specified by AccuracyGoal and PrecisionGoal but was unable to find a sufficient decrease in the function. You may need more than MachinePrecision digits of working precision to meet these tolerances. >>

```
Minimum: 3.62008

1  x1=-0.05   x2=0.05  f(x1)=4.75006   f(x2)=
 5.24994     Aproksimacija: -1.975  Pogreska: 5.59508

2  x1=-2.025   x2=-1.925  f(x1)=11.0231   f(x2)=
 10.9083     Aproksimacija: -0.9875  Pogreska: 4.60758

3  x1=-1.0375   x2=-0.9375  f(x1)=7.70411   f(x2)=
 7.15051     Aproksimacija: -0.49375  Pogreska: 4.11383

4  x1=-0.54375   x2=-0.44375  f(x1)=4.72587   f(x2)=
 4.06256     Aproksimacija: -0.246875  Pogreska: 3.86695

5  x1=-0.296875   x2=-0.196875  f(x1)=3.52871
    f(x2)=4.01944     Aproksimacija: -0.370312  Pogreska: 3.99039
```



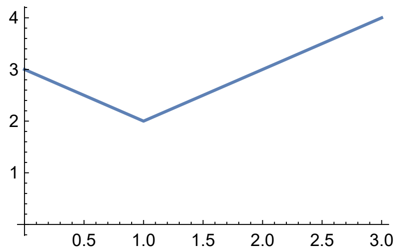
Metoda zlatnog reza

```
{(Sqrt[5] - 1) / 2., (3 - Sqrt[5]) / 2.}
N[GoldenRatio]
1 / N[GoldenRatio]
Solve[x^2 + x - 1 == 0, x] // N
Graphics[{Gray, Rectangle[{0, 0}, {GoldenRatio, 1}]}]

(*Pogledati help*)
```

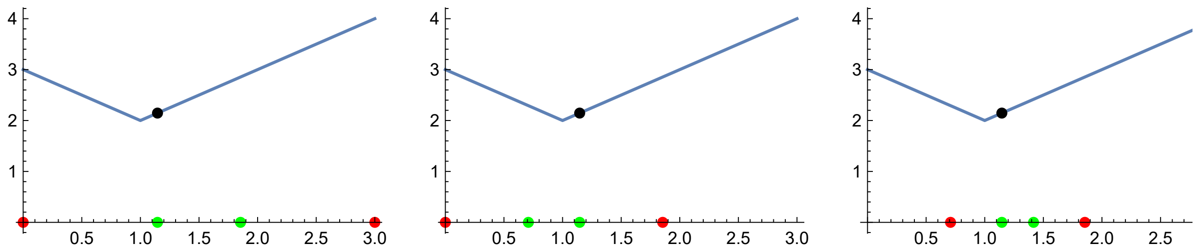
```
{0.618034, 0.381966}

1.61803

0.618034

{{x → -1.61803}, {x → 0.618034}}
```

Primjer 1.

```
a = 0; b = 3;  xz = 1;
f[x_] := Abs[x - 1] + 2
sl1 = Plot[f[x], {x, a, b}, AxesOrigin → {0, 0}, ImageSize → 200]
xz = 1;  n = 5;
xa = Table[0, {i, n}];
sl = Table[0, {i, n}];
Do[
  x1 = a + (3 - Sqrt[5.]) (b - a) / 2;
  x2 = a + (Sqrt[5.] - 1) (b - a) / 2;
  If[f[x1] ≤ f[x2], xa[[i]] = x1, xa[[i]] = x2];
  Print[i, "   Interval: [", a, ",  ", b "]", "  x1=",
   x1, "   x2=", x2, "  f(x1)=", f[x1], "   f(x2)=", f[x2],
   "     Aproksimacija: ", xa[[i]], "  Pogreska: ", Abs[xa[[i]] - xz]];
  sl[[i]] = Show[{sl1, Graphics[{PointSize[.03], Point[{{xa[[i]], f[xa[[i]]]}}],
       Red, Point[{{a, 0}, {b, 0}}], Green, Point[{{x1, 0}, {x2, 0}}]}]}];
  If[f[x1] ≤ f[x2], b = x2;, a = x1;];
  , {i, n}];
GraphicsRow[sl]
```



```
1   Interval: [0,  3 ]  x1=1.1459   x2=1.8541  f(x1)=2.1459
    f(x2)=2.8541     Aproksimacija: 1.1459  Pogreska: 0.145898

2   Interval: [0,  1.8541 ]  x1=0.708204   x2=1.1459  f(x1)=
 2.2918   f(x2)=2.1459     Aproksimacija: 1.1459  Pogreska: 0.145898

3   Interval: [0.708204,  1.8541 ]  x1=1.1459   x2=1.41641  f(x1)=
 2.1459   f(x2)=2.41641     Aproksimacija: 1.1459  Pogreska: 0.145898

4   Interval: [0.708204,  1.41641 ]  x1=0.978714   x2=1.1459  f(x1)=
 2.02129   f(x2)=2.1459     Aproksimacija: 0.978714  Pogreska: 0.0212862

5   Interval: [0.708204,  1.1459 ]  x1=0.875388   x2=0.978714  f(x1)=
 2.12461   f(x2)=2.02129     Aproksimacija: 0.978714  Pogreska: 0.0212862
```



```
((Sqrt[5.] - 1) / 2) ^ (4 + 1) * (b - a)
```

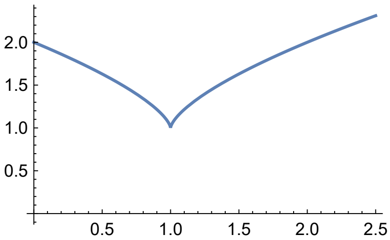
```
0.0243919
```

```
eps = 0.0005;
(Log[eps] - Log[b - a]) / Log[(Sqrt[5.] - 1) / 2] - 1
```

```
12.0783
```

Primjer 2.

```
a = 0; b = 2.5;  xz = 1;
f[x_] := 1 + ((x - 1) ^2) ^ (1 / 3)
sl1 = Plot[f[x], {x, a, b}, AxesOrigin → {0, 0}, ImageSize → 200]
xz = 1; n = 5;
xa = Table[0, {i, n}];
sl = Table[0, {i, n}];
Do[
  x1 = a + (3 - Sqrt[5.]) (b - a) / 2;
  x2 = a + (Sqrt[5.] - 1) (b - a) / 2;
  If[f[x1] ≤ f[x2], xa[[i]] = x1, xa[[i]] = x2];
  Print[i, "   Interval: [", a, ",  ", b "]", "  x1=",
   x1, "   x2=", x2, "  f(x1)=", f[x1], "   f(x2)=", f[x2],
   "     Aproksimacija: ", xa[[i]], "  Pogreska: ", Abs[xa[[i]] - xz]];
  sl[[i]] = Show[{sl1, Graphics[{PointSize[.03], Point[{{xa[[i]], f[xa[[i]]]}}],
       Red, Point[{{a, 0}, {b, 0}}], Green, Point[{{x1, 0}, {x2, 0}}]}]}];
  If[f[x1] ≤ f[x2], b = x2;, a = x1;];
  , {i, n}];
GraphicsRow[sl]
```




```
1   Interval: [0, 2.5 ]  x1=0.954915   x2=1.54508  f(x1)=1.12667
    f(x2)=1.66728     Aproksimacija: 0.954915  Pogreska: 0.045085

2   Interval: [0, 1.54508 ]  x1=0.59017   x2=0.954915  f(x1)=
 1.55174   f(x2)=1.12667     Aproksimacija: 0.954915  Pogreska: 0.045085

3   Interval: [0.59017, 1.54508 ]  x1=0.954915   x2=1.18034  f(x1)=
 1.12667   f(x2)=1.3192     Aproksimacija: 0.954915  Pogreska: 0.045085

4   Interval: [0.59017, 1.18034 ]  x1=0.815595   x2=0.954915  f(x1)=
 1.32398   f(x2)=1.12667     Aproksimacija: 0.954915  Pogreska: 0.045085

5   Interval: [0.815595, 1.18034 ]  x1=0.954915   x2=1.04102  f(x1)=
 1.12667   f(x2)=1.11894     Aproksimacija: 1.04102  Pogreska: 0.0410197
```