Лабораторная №3

Вариант №3

Выполнил студент группы P3212 Балин Артем

In [ ]:
```
from lab3 import *
def f(x):
    return (x**4)/4+x**2-8*x+12
def f_x(x):
    return x**3+2*x-8
def f_xx(x):
    return 3*x**2+2
a = 0
b = 2
e = 0.05
func = function(a,b,e,f, f_x, f_xx)
```

In [ ]:
```
bisecting_res = func.bisecting()
bisecting_x = bisecting_res.result[-1][6]
print("Bisecting method: x = ", bisecting_x)
print("f(x) = ", f(bisecting_x))
print()
bisecting_res.print_result()
```

```
Bisecting method: x =  1.63984375
f(x) =  3.3781354529039014

 k  |   a     |   b     |   x1    |   x2    | f(x1)   | f(x2)   |   x     |  f(x)   |
-------------------------------------------------------------------------------------
 1  | 0.0000  | 2.0000  | 0.9750  | 1.0250  | 5.3765  | 5.1266  | 1.0000  | 5.2500  |
 2  | 0.9750  | 2.0000  | 1.4625  | 1.5125  | 3.5826  | 3.4960  | 1.4875  | 3.5366  |
 3  | 1.4625  | 2.0000  | 1.7063  | 1.7563  | 3.3802  | 3.4128  | 1.7313  | 3.3931  |
 4  | 1.4625  | 1.7563  | 1.5844  | 1.6344  | 3.4106  | 3.3800  | 1.6094  | 3.3922  |
 5  | 1.5844  | 1.7563  | 1.6453  | 1.6953  | 3.3766  | 3.3767  | 1.6703  | 3.3734  |
 6  | 1.5844  | 1.6953  | 1.6148  | 1.6648  | 3.3890  | 3.3735  | 1.6398  | 3.3781  |
```

In [ ]:
```
golden_res = func.gold_section()
golden_x = golden_res.result[-1][6]
print("Golden section method: x = ", golden_x)
print("f(x) = ", f(golden_x))
print()
golden_res.print_result()
```

```
Golden section method: x =  1.652438064
f(x) =  3.375024992470429

 k  |   a     |   b     |   x1    |   x2    | f(x1)   | f(x2)   |   x     |  f(x)   |
-------------------------------------------------------------------------------------
 1  | 0.0000  | 2.0000  | 0.7640  | 1.2360  | 6.5569  | 4.2232  | 1.0000  | 5.2500  |
 2  | 0.7640  | 2.0000  | 1.2360  | 1.5278  | 4.2232  | 3.4738  | 1.3820  | 3.7659  |
 3  | 1.2360  | 2.0000  | 1.5278  | 1.7082  | 3.4738  | 3.3809  | 1.6180  | 3.3873  |
 4  | 1.5278  | 2.0000  | 1.7082  | 1.8196  | 3.3809  | 3.4948  | 1.7639  | 3.4203  |
 5  | 1.5278  | 1.8196  | 1.6393  | 1.7082  | 3.3783  | 3.3809  | 1.6737  | 3.3735  |
 6  | 1.5278  | 1.7082  | 1.5967  | 1.6393  | 3.4008  | 3.3783  | 1.6180  | 3.3873  |
 7  | 1.5967  | 1.7082  | 1.6393  | 1.6656  | 3.3783  | 3.3735  | 1.6524  | 3.3750  |
```

In [ ]:
```
chords_res = func.chord()
chords_x = chords_res.result[-1][-3]
print("Chords method: x = ", chords_x)
print("f(x) = ", f(chords_x))
```

```
print()
chords_res.print_result()
```

```
Chords method: x =  1.6691054537094632
f(x) =  3.3733972185530625

 k  |   a     |   b     | f'(a)   | f'(b)   |   x     | f'(x)   |  f(x)   |
-------------------------------------------------------------------------
 1  | 0.0000  | 2.0000  |-8.0000  | 4.0000  | 1.3333  |-2.9630  | 3.9012  |
 2  | 1.3333  | 2.0000  |-2.9630  | 4.0000  | 1.6170  |-0.5378  | 3.3878  |
 3  | 1.6170  | 2.0000  |-0.5378  | 4.0000  | 1.6624  |-0.0809  | 3.3737  |
 4  | 1.6624  | 2.0000  |-0.0809  | 4.0000  | 1.6691  |-0.0118  | 3.3734  |
```

In [ ]:
```
newton_res = func.newton()
newton_x = newton_res.result[-1][0]
print("Newton method: x = ", newton_x)
print("f(x) = ", f(newton_x))
print()
newton_res.print_result()
```

```
Newton method: x =  1.6711590296495957
f(x) =  3.373394827694206

 k  |   x     | f'(x)   | f''(x)  |  f(x)   |
-------------------------------------------
 1  | 1.0000  |-5.0000  | 5.0000  | 4.0000  |
 2  | 2.0000  | 4.0000  |14.0000  | 3.3836  |
 3  | 1.7143  | 0.4665  |10.8163  | 3.3734  |
 4  | 1.6712  | 0.0095  |10.3783  | 3.3734  |
```