Kirill Zakharov
Pade Approximation

```
Clear[padeApprox]
```

```
funD[fun_, y_, k_, h_] := D[fun[y], {y, k}] /. y → h
```

fun - функция

x0 - начальное приближение

m - число итераций

ξ - точность решения

```
padeApprox[fun_, x0_, m_, ξ_] :=
 Module[{t, x = x0, array = {}, iter}, Do[If[fun[x] < ξ, Break[],
     t = -fun[x] / funD[fun, k, i, x]; x = x^2 / (x - t); AppendTo[array, x]],
    {i, 1, m}];
  N /@ array]
```

Пример 1

```
fun1[y_] := e^y - 2
```

```
test1 = padeApprox[fun1, 1, 20, 0.001]
```

{0.790988, 0.707607, 0.693537}

```
test2 = padeApprox[fun1, 1, 20, 0.0001]
```

{0.790988, 0.707607, 0.693537, 0.693147}

Итерация, при которой достигли заданной точности

```
test2 // Length
```

4

Проверка

```
Log[2] // N
```

0.693147

Невязка

```
fun1[test2 // Last]
```

5.88707×10^{-7}

Пример 2

```
fun[y_] := y^3 + 6 y^2 + 9 y - 4
```

```
lst = padeApprox[fun, 3.6, 3, 0.01]
```

{2.45556, 1.19643, 0.354205}

Ответ

```
lst[[3]]
```

```
0.354205
```

Итерация, при которой достигли заданной точности

```
lst // Length
```

```
3
```

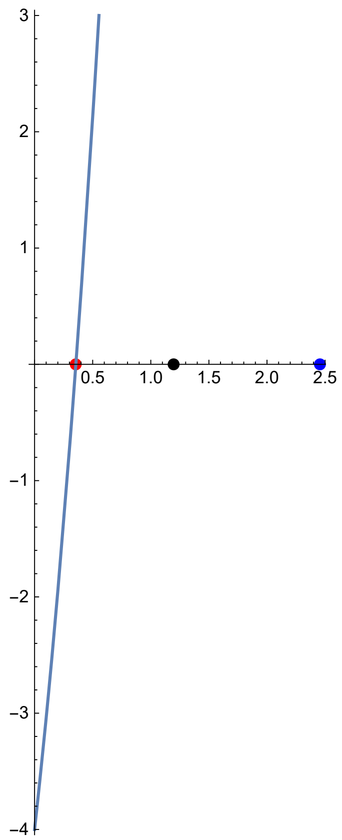
Невязка

```
fun[lst[[3]]]
```

```
-0.0149463
```

Визуальное представление

```
Show[Graphics[{PointSize[0.04], Blue, Point[{lst[[1]], 0}],
   Black, Point[{lst[[2]], 0}], Red, Point[{lst[[3]], 0}]}, Axes → True],
 Plot[x^3 + 6 x^2 + 9 x - 4, {x, -5, 5}, PlotRange → {Automatic, {-4, 3}}]]
```



Проверка

```
Solve[x^3 + 6 x^2 + 9 x - 4 == 0, x]
```

```
{{x → 0.355…}, {x → -3.18… - 1.08… i}, {x → -3.18… + 1.08… i}}
```