

Quadratic interpolation KZ

```
qInterp[fun_, x0_, k_, a_] := Module[{x = x0, iter, t, r},
  t = N[-fun[x]/D[fun[y], y] /. y -> x];
  r = N[(1/D[fun[y], y] /. y -> x) * t^2 * D[fun[y], {y, 2}] /. y -> x];
  Do[
    If[Abs@fun[x] < a, Break[],
      x = x + t -  $\frac{1}{2}$  r; t = N[-fun[x]/D[fun[y], y] /. y -> x];
      r = N[(1/D[fun[y], y] /. y -> x) * t^2 * D[fun[y], {y, 2}] /. y -> x];
    iter = i,
    {i, 1, k}];
  {x, iter}]
```

Test 1

```
fun[x_] :=  $e^x - 5$ 
```

```
qInterp[fun, 2, 10, 0.0001]
```

```
{1.60944, 2}
```

```
Log[5] // N
```

```
1.60944
```

Test 2

```
fun1[x_] :=  $x^3 + 6x^2 + 9x - 4$ 
```

```
qInterp[fun1, 1, 10, 0.0001]
```

```
{0.355301, 3}
```

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

```
{{x -> 0.355...}, {x -> -3.18... - 1.08... i}, {x -> -3.18... + 1.08... i}}
```