

Package ‘FindAllRoots’

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Type Package

Title Find all root(s) of the equation and Find root(s) of the equation by dichotomy

Version 1.0

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Description Find all root(s) of the equation,including complex roots;Find root(s) of the equation by dichotomy.Besides,in dichotomy, more than one interval can be given at a time.

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FindAllRoots-package *Find all root(s) of the equation and Find root(s) of the equation by dichotomy*

Description

Find all root(s) of the equation,including complex roots;Find root(s) of the equation by dichotomy

Details

Package: FindAllRoots
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 Version: 1.0
 Date: 2012-07-13
 License: GPL (>= 2)

Author(s)

Bingpei Wu & Jiajun He & Sijie Chen & Yangyang Liu
 Maintainer: Bingpei Wu<jianpeizhon@126.com>

References

a passage about finding all roots,whose author is Dequan Shang a passage about finding root(s) of equation ,whose author is Yong Ling

Examples

```
a=c(2,-1,-13,-1,-5)
b=c(4:0)
x1=c(1:10)
x2=c(2:11)
allroots(a,b)
dichotomy(x1,x2,a,b)
```

allroots

Find all roots of the equation,including complex roots.

Description

find all roots of the equation,including complex roots

Usage

```
allroots(a, b)
```

Arguments

a vector of coefficients of the equation
 b vector of exponention of the equation,One one corresponding with a mentioned above

Details

a should be one one corresponding with b,or there might lead to wrong results

Value

all roots of the equation,including complex roots.Besides,the inaccuracy error of the roots is also given

Author(s)

Bingpei Wu

References

a passage about finding all roots,whose author is Dequan Shang

Examples

```
##---- Should be DIRECTLY executable !! ----
##-- ==> Define data, use random,
##--or do help(data=index) for the standard data sets.
a=c(2,-1,-13,-1,-5)
b=c(4:0)
allroots(a,b)

## The function is currently defined as
function (a, b)
{
  a1 = a
  b1 = b
  n = length(b) - 1
  a = a/a[1]
  b = matrix(0, ncol = n, nrow = n)
  for (i in 1:(n - 1)) b[i, i + 1] = 1
  for (i in 1:n) b[n, i] = -a[n + 2 - i]
  c = eigen(b)
  print(c$values)
  print("inaccuracy error")
  print(f(c$values, a1, b1))
}
```

dichotomy

Find root(s) of the equation by dichotomy

Description

Find root(s) of the equation by dichotomy.Besides,in dichotomy, more than one interval can be given at a time.

Usage

```
dichotomy(x1, x2, a, b, pert = 10-5, n = 1000, s = 0.1)
```

Arguments

x1	vector of left end point of interval(s)
x2	vector of right end point of interval(s)
a	vector of coefficients of the equation
b	vector of exponention of the equation,One one corresponding with a mentioned above
pert	precision of root(s)
n	the algorithm runs n times at most in one interval and NA will be returned
s	assuming x0 is midpoint of interval [a,b].If $f(x_0)*f(a)>0$ and $f(x_0)*f(b)>0$,b will minus s.

Details

If you want to find root(s) of the equation in $[a_1,b_1],[a_2,b_2],\dots,[a_n,b_n]$,x1 should be $c(a_1,a_2,\dots,a_n)$ and x2 should be $c(b_1,b_2,\dots,b_n)$. If there is no root in $[a_1,b_1]$,but there is a root in $[\min(a_1,b_1-n*s),\max(a_1,b_1-n*s)]$,the algorithm can still find the root.So the returned root may not in $[a_n,b_n]$ that you give but must be in $[\min(a_1,b_1-n*s),\max(a_1,b_1-n*s)]$.

Value

the root(s) of the equation that the difference between returned root(s) and the real root(s) of the equation is less than $10e-6$

Author(s)

Bingpei Wu

References

a passage about finding root(s) of equation ,whose author is Yong Ling

Examples

```
##---- Should be DIRECTLY executable !! ----
##-- ==> Define data, use random,
##--or do help(data=index) for the standard data sets.
a=c(2,-1,-13,-1,-5)
b=c(4:0)
x1=c(1:10)
x2=c(2:11)
dichotomy(x1,x2,a,b)

## The function is currently defined as
function (x1, x2, a, b, pert = 10^(-5), n = 1000, s = 0.1)
{
  x0 = rep(NA, length(x1))
  for (i in 1:length(x1)) {
    if (f(x1[i], a, b) == 0)
```

```

        x0[i] = x1[i]
    if (f(x2[i], a, b) == 0)
        x0[i] = x2[i]
    if (f(x1[i], a, b) != 0 & f(x2[i], a, b) != 0) {
        x0[i] = (x1[i] + x2[i])/2
        k = 1
        while ((abs(f(x0[i], a, b)) >= pert) & (k < n)) {
            if (f(x0[i], a, b) == 0)
                break
            if (f(x1[i], a, b) * f(x0[i], a, b) < 0)
                x2[i] = x0[i]
            if (f(x2[i], a, b) * f(x0[i], a, b) < 0)
                x1[i] = x0[i]
            if (x1[i] != x0[i] & x2[i] != x0[i])
                x2[i] = x2[i] - s
            x0[i] = (x1[i] + x2[i])/2
            k = k + 1
            if (k == 1000)
                x0[i] = NA
        }
    }
}
x0
}

```

f

function returning one function value, or a vector of function values.

Description

function returning one function value, or a vector of function values.

Usage

f(x, a, b)

Arguments

x	either one value or a vector containing the x-value(s)
a	vector of coefficients of the equation
b	vector of exponention of the equation,One one corresponding with a mentioned above

Details

the function f that estimates the function values will be called as f(x, ...). If x is a vector, then the first argument passed to f should also be a vector.

Value

the value(s) of the function equation, one function value, or a vector of function values.

Author(s)

Bingpei Wu

Examples

```
##---- Should be DIRECTLY executable !! ----
##-- ==> Define data, use random,
##--or do help(data=index) for the standard data sets.
a=c(2,-1,-13,-1,-5)
b=c(4:0)
x=c(1:3)
f(x,a,b)

## The function is currently defined as
function (x, a, b)
{
  z = 0
  for (i in 1:length(b)) z = z + a[i] * x^(b[i])
  z
}
```

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