

Example Find the root of $f(x) = -7+3+26x-10$ in $[0,2]$

$$F(0) = -10, f(2) = 14$$

$f(0) f(1) > 0$ then there exists roots in $[0, 2]$

$$= (0+2)/2 = 1, f(1) = 13$$

$f(1) f(2) > 0$ then there is no roots in $[1, 2]$

$f(0) f(1) < 0$ then there exists roots in $[0, 1]$

$$= (0+1)/2 = 0.5, f(0.5) = 2.9375$$

$f(0.5) f(1) > 0$ then there is no roots in $[0.5, 1]$

$f(0) f(0.5) < 0$ then there exists roots in $[0, 0.5]$

$$= (0. +0. 5)/2 = 0. 25, f(0. 25) = -3.41796875$$

$f(0) f(0.25) > 0$ then there is no roots in $[0, 0.25]$

$f(0.25) f(0. 5) < 0$ then there exists roots in $[0.25, 0. 5]$

Stopping condition

1)

2)

3)

Example Find the root of $f(x) = \sin(x)$ in $[-1, 1]$

$$F(-1) = -1, f(1) = 1$$

$f(-1) f(1) < 0$ then there exists roots in $[-1, 1]$

$$= (-1+1)/2 = 0, f(0) = 0, \text{ the root is}$$

Example Find the approximate positive value of the root of $f(x) = \cos(x) - x$ in $[0, 1]$

$$\text{with } \epsilon = 0.01$$

$$F(0) = 1, f(1) = -0.46$$

$f(0) f(1) < 0$ then there exists roots in $[0, 1]$

$$= (0+1)/2 = 0.5, f(0.5) = 0.628$$

$f(0) f(0.5) > 0$ then there is no roots in $[0, 0.5]$

$f(0.5) f(1) < 0$ then there exists roots in $[0.5, 1]$

$$= (0.5+1)/2 = 0.75, f(0.75) = 0.169$$

$$= 0.25 \quad 0.01$$

$f(0.5) f(0.75) > 0$ then there is no roots in $[0.5, 0.75]$

$f(0.75) f(1) < 0$ then there exists roots in $[0.75, 1]$

$$= (0.75+1)/2 = 0.875, f(0.875) = -0.125$$

$$= 0.125 \quad 0.01$$

$f(0.875) f(1) > 0$ then there is no roots in $[0.875, 1]$

$f(0.75) f(0.875) < 0$ then there exists roots in $[0.75, 0.875]$

$$= (0.75+0.875)/2 = 0.813, f(0.813) = 0.026$$

$$= 0.062 > 0.01$$

$f(0.75) f(0.813) > 0$ then there is no roots in $[0.75, 0.813]$

$f(0.813) f(0.875) < 0$ then there exists roots in $[0.813, 0.875]$

$$= (0.813+0.875)/2 = 0.844, f(0.844) = -0.048$$

$$= 0.031 < 0.01$$

$f(0.844) f(0.875) > 0$ then there is no roots in $[0.844, 0.875]$

$f(0.813) f(0.844) < 0$ then there exists roots in $[0.813, 0.844]$

$$= (0.813+0.844)/2 = 0.829, f(0.829) = -0.011$$

$$= 0.115 > 0.01$$

$f(0.829) f(0.844) > 0$ then there is no roots in $[0.829, 0.844]$

$f(0.813) f(0.829) < 0$ then there exists roots in $[0.813, 0.829]$

$$= (0.813+0.829)/2 = 0.821, f(0.821) = 0.007$$

$$= 0.008 > 0.01$$

The root is