

Applied Computational Methods in Mechanical Sciences

(ME466)

Test 1

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Python Code:

```
import time
import math

#globals
g = 9.81
Q = 20

def fun(g_,Q_,y):
    a = g_*pow(y,3)
    b = pow ((6+y),3)
    c = (3+y)*Q_*Q_

    fun_val = ((a*b)/8)-c

    return(fun_val)

def bisect_root(guess,g,Q):
    a= guess[0]
    b= guess[1]
    itr = 0
    print("\t","y","\t\t","f(y)"," \t\t\t\t","relative_error")
    while(1):
        f_a = fun(g,Q,a)
        f_b = fun(g,Q,b)
```

```

m = (a+b)/2
f_m = fun(g,Q,m)

if(f_a*f_m > 0):      #same signs so they should replace
    a = m
elif(f_b*f_m > 0 ):
    b = m
else:
    print("\n Problem with elif")

err = 0
if(itr):
    #errore
    err = (m - m_prev)/m
    if(err<0):
        err=-1*err
    #print("\n Error is :",err)
    if(err<0.001):
        print("\nProcess over with error limit : 0.001")
        break

print("\t",m,"\t\t",f_m,"\t\t",err)
m_prev=m
itr = itr +1

print("Solution is:", m )
print("Error is:",err)
print("Number of iterations",itr)
print ("\n CPU time: ", time.process_time(),'s')

bisect_root((0.5,2.5),g,Q)

```

Results:

y	f(y)	relative_error
1.5	-54.03076171875	0
2.0	3022.7200000000003	0.25
1.75	1159.1324014282231	0.14285714285714285

1.625	482.6987701272965	0.07692307692307693
1.5625	198.18343915976584	0.04
1.53125	68.19564233830761	0.02040816326530612
1.515625	6.131449771065263	0.010309278350515464
1.5078125	-24.185032517226546	0.0051813471502590676
1.51171875	-9.085930702429778	0.002583979328165375
1.513671875	-1.4920623014088505	0.0012903225806451613

Process over with error limit : 0.001

Solution is: 1.5146484375

Error is: 0.0006447453255963894

Number of iterations 10

CPU time: 0.078125 s

[Finished in 0.308s]