

# **MATH-501: Homework # 1**

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## Contents

Problem # 1 . . . . .	3
1a . . . . .	3
1b . . . . .	3
1c . . . . .	3

**Problem # 1****1a**

$f(x) = \tan(x)$  on interval  $[a, b] = [-4.9, 5.1]$   
 $f(a) = \tan(-4.9) = 0.7854$  and  $f(b) = \tan(5.1) = -1.3695$   
Since  $\tan(x) \in C[-4.9, 5.1]$  and  $f(-4.9)f(5.1) < 0$  the conditions required for bisection method to converge are satisfied.  
The Number of iterations is given by  $M = \lceil \log_2(\frac{b-a}{2\delta}) \rceil$  where  $\delta = \text{Absolute error} = 10^{-2}$   
Hence  $M = \lceil \log_2(\frac{10}{2*10^{-2}}) \rceil = 9$

**1b**

$c_0 = \frac{a+b}{2} = 0.1$  and  $f(c_0) = 0.0997 \implies f(c_0)f(b) < 0$  Hence  $c_1 = \frac{c_0+b}{2} = 2.5$  and  $f(c_1) = 1.2036$   
 $\implies f(c_1)f(b) < 0$   
Hence  $c_2 = \frac{c_1+b}{2} = 3.85$  and again  $f(c_2)f(b) < 0$  so  
 $c_3 = \frac{c_2+b}{2} = 4.475$  and  $f(c_3) = 1.3509$  and still  $f(c_3)f(b) < 0$

**1c**