



İ s t a n b u l K ü l t ü r U n i v e r s i t y
Department of Computer Engineering

MAT 002 - NUMERICAL METHODS
Spring 2010-2011

First Midterm

March 17, 2011

Number:

Name:

Directions

- You have 120 minutes to complete the exam. Please do not leave the examination room in the first 30 minutes of the exam. There are six questions, of varying credit (100 points total). Indicate clearly your final answer to each question. You are allowed to use a calculator. During the exam, please turn off your cell phone(s). You cannot use the book or your notes. You have one page for “cheat-sheet” notes at the end of the exam papers. Do use the **radian mode** on your calculator when using the trigonometry buttons. Please use **five-decimal digit** in your calculations. The answer key to this exam will be posted on Department of Mathematics and Computer Science board after the exam.

Good luck!

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Question 1.	
Question 2.	
Question 3.	

Question 4.	
Question 5.	
Question 6.	

MARK _____

- (a) Find an interval containing a solution of $\tan x - 2x + 1 = 0$.

Answer.

- (b) How many bisection iterations would be required to locate this root in this interval to accuracy of $\varepsilon = 10^{-6}$.

Answer.

Question 3.

20 points

Use the Newton's Method to find a solution to within $\varepsilon = 10^{-4}$ for the function $f(x) = x^3 - e^{-x}$ where $0.5 \leq x \leq 1$, starting with $p_0 = 0.5$.

Answer.

n	p_n	$f(p_n)$
0		
1		
2		
3		

Question 4.

15 points

Show that $g(x) = (3x + 19)^{\frac{1}{3}}$ has a unique fixed point in the interval $[0, \infty)$.

Hint: First show the existence and then the uniqueness.

Answer.

Question 5.

20 points

Use four steps of the Bisection Method to find an approximate root of $\sin x = 0.8x$ starting with $a_0 = 1$ and $b_0 = 1.5$.

Answer.

n	a_n	b_n	p_n	$f(p_n)$
0				
1				
2				
3				

- (a) Find the second Taylor Polynomial $P_2(x)$ for the function $f(x) = xe^x + x$ about $x_0 = 0$, and use $P_2(0.2)$ to approximate $f(0.2)$.

Answer.

- (b) Find the absolute error and relative error in (a).

Answer.