



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

Final Exam

May 23, 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 five questions with 20 points (total 100 point). 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 double-sided 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.	
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Question 1.

20 points

Use the False Position Method to find the root of $x \sin x - 1 = 0$ that is located in the interval $[0, 2]$, within $\varepsilon = 10^{-4}$.

Answer.

Question 2.

20 points

Let $f(x) = \sqrt{x - x^2}$ and $P_2(x)$ be the interpolating polynomial on $x_0 = 0$, $x_1 = \alpha$, and $x_2 = 1$. Find the largest value of α in $(0, 1)$ for which $f(0.5) - P_2(0.5) = -0.25$.

Answer.

- (a) Use the most accurate three-point formula to determine **two** of four missing entries in the following table.

x_i	$x_0 = 1$	$x_1 = 1.5$	$x_2 = 2.0$	$x_3 = 2.5$
$f(x)$	3.7183	5.8872	9.0822	14.099
$f'(x)$				

Answer.

- (b) The data in (a) were taken from the function $f(x) = e^x + \ln x + 1$. Compute the actual errors, and find error bounds using the error formulas for two approximations obtained in (a).

Answer.

Question 4.

20 points

Suppose $f(1.25) = f(1.75) = \beta$. Find β if the Composite Trapezoidal Rule with $n = 2$ gives the value 4, for $\int_1^2 f(x)dx$, and with $n = 4$ gives the value 3.

Answer.

Question 5.

20 points

Use the Composite Simpson's Rule with $h = 0.25$ to approximate the value of the improper integral $\int_0^1 \frac{\ln(x+1)}{x} dx$.

Answer.