King Saud University
Department of Mathematics
1st Semester 1433-1434 H

MATH 253-MATH 352 (Numerical Analysis)
2nd Midterm Exam
Duration: 90 Minutes

Student's Name	Student's ID	Group No.	Lecturer's Name

Question No.	I	II	III	Total
Mark				

[**I**] Determine whether the following is **True** or **False**. **Justify** your answer.

(1) In Newton forward difference formula $P_n(x) = \sum_{k=0}^{n} \begin{pmatrix} s \\ k \end{pmatrix} \triangle^k f(x_0)$, $\triangle^2 f(x_0)$ equals $f[x_0, x_1, x_2]$. ( )

(2) Simpson's rule for numerical integration gives exact result when applied to $f(x) = \frac{x^4+\sqrt{2}x^2}{x}$. ( )

OVER

(3) Using the Composite Trapezoidal Rule with $n = 4$, the integral $\int_0^2 x^3 dx$ is approximated by 4.25. ( )

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(4) If the composite midpoint rule is used to compute $\int_0^2 3x^2 dx$ with an error of at most 10^{-3}, then the minimum number of subintervals needed is 12. ( )

[II] Use Lagrange interpolating polynomials of degree 2 to approximate $f(1.25)$, where $f(1.1) = 0.4860, f(1.2) = 0.8616$ and $f(1.3) = 1.598$.

OVER

[III] Use the data in the following table to answer all parts of this question.

x	0.1	0.2	0.3	0.4	0.5
$f(x)$	1.01005	1.04081	1.09417	1.17351	1.28402

(a) Approximate $f(0.25)$ using Newton's forward divided difference formula with 3 points.

(b) If you know that $f(x) = e^{x^2}$, find the absolute error of your approximation in (a).

(c) Approximate $f''(0.3)$ using a 3-point formula.

(d) Compute the composite Simpson's approximation for $\int_{0.1}^{0.5} e^{x^2} dx$ with $n = 4$.

Good Luck