KABARAK   UNIVERSITY

UNIVERSITY EXAMINATIONS

2008/2009 ACADEMIC YEAR

FOR THE DEGREE OF BACHELOR OF EDUCATION

SCIENCE

COURSE CODE: MATH 314

COURSE TITLE: NUMERICAL ANALYSIS 1

STREAM: SESSION VII & IX

DAY: MONDAY

TIME: 2.00 – 4.00 P.M.

DATE: 10/08/2009

INSTRUCTIONS:

ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS

PLEASE TURN OVER

QUESTION 1 (30 MARKS)

a. Evaluate $I = \int_{0}^{6} \frac{1}{1+x} dx$ where n = 6 using:

   (i) Trapezoidal rule
   (ii) Simpson's rule   (5 marks)

b. y = f(x) is a polynomial of degree 3 and the following table gives the values of x and y. Locate and correct the wrong values of y:

x:	0	1	2	3	4	5	6
y:	4	10	30	75	160	294	490

                                                                          (5 marks)

c. Solve $(\frac{\Delta^2}{E}) x^3$ (4 marks)

d. Find the sixth term of the sequence 8, 12, 19, 29, 42, -----

                                                                          (5 marks)

e. The following table gives the population of a certain country. Find the population in the year 2001 using the Advancing difference formula:

Year	1941	1951	1961	1971
Population(in millions)	352	405	473	554

                                                                          (5 marks)

f. Find the first and second derivative of the function tabulated below at x = 0.6 using Stirling's formula:

x:	0.4	0.5	0.6	0.7	0.8
y:	1.5836	1.7974	2.0442	2.3275	2.6511

                                                                          (6 marks)

QUESTION TWO (20 MARKS)

a. Make a divided difference table of $f(x) = x^3 + x + 2$ for the arguments:

   1 3 6 11   (4 marks)

b. Find the formula for calculating the absolute error and relative error of
   $x_1 x_2 x_3 - - - - - - - - - - x_n$ (4 marks)

c. The following table gives the values of y which a polynomial of degree 5. It is known that y = f(3) has an error. Correct the error.

x:	0	1	2	3	4	5	6
y:	1	2	33	254	1025	3126	7777

(4 marks)

d. Find the values of y at x = 21 and x = 28 from the following data:

x:	20	23	26	29
y:	3420	3907	4384	4848

(8 marks)

QUESTION THREE (20 MARKS)

a. Use Newton's Backward formula to find y(-1) if y(0) = 2, y(1) = 9, y(2) = 28, y(3) = 65, y(4) = 126, y(5) = 217. (4 marks)

b. Find f(x) from the table below. Also find f (7).

x :	0	1	2	3	4	5	6
f(x):	-1	3	19	53	111	199	323

(6 marks)

c. Solve the equation $x^3 + x^2 - 1 = 0$ for the positive root by iteration method.

(5 marks)

d. Find a positive root of $xe^x = 2$ by the Regula Falsi method

(5 marks)

e. Use Netwon Raphson method to find the root between 0 and 1 of $x^3 = 6x - 4$ correct to five decimal places. (5 marks)

QUESTION 4 (20 MARKS)

a. Prove that:

$\Delta [f(x)g(x)] = f(x+h) \Delta g(x) + g(x) \Delta f(x)$ (3 marks)
Hence evaluate: $\Delta e^{2x} \log 3x$ (3 marks)

b. Evaluate:

$(\nabla + \Delta)^2 (x^2 + x + 1)$ (5 marks)

c. Proof that $1 + \mu^2 \delta^2 = (1 + \frac{1}{2} \delta^2)^2$ (4 marks)

d. From the following table, find the value when x=50

x:	15	20	25	30	35
y:	1.558	1.806	2.094	2.427	2.814

(5 marks)

QUESTION 5 (20 MARKS)

a. Make a divided difference table from the following data:

x:	-2	0	3	5	7	8
y:	-792	108	-72	48	-144	-252

(4 marks)

b. The population of a certain town is given below. Find the growth rate   of the population in 1931, 1941, 1961 and 1971.

x(Year):	1931	1941	1951	1961	1971
y(Population Thousands):	40.62	60.80	79.95	103.56	132.65

(12 marks)

c. Evaluate $\int_0^1 \frac{dx}{1+x^2}$, using Trapezoidal rule with h = 0.2. Hence obtain an appropriate value of π. can you use other formulae in this case?.

(4 marks)