Quiz 1 in ch1 and 2.1

Question **1**

Correct

Mark 1.00 out of 1.00

Flag question

Using three digits rounding, the value of $\ln 3 + \frac{1}{6}\sin(\ln 3) =$

- a. 0.842
- b. 1.20
- c. 0.840
- d. 1.24
- e. 1.25

The correct answer is: 1.25

Question **2**

Correct

Mark 1.00 out of 1.00

Flag question

The four digits representation of $p = \frac{3}{7}$ in chopping is

- a. 0.428
- b. 0.4285
- c. 0.4280
- d. 0.429
- e. 0.4286

The correct answer is: 0.4285

Question **3**

Correct

Mark 1.00 out of 1.00

Flag question

If a diameter of square is measured as $\tilde{d} = 2.06$ cm but the actual diameter is **d=2**, then $\tilde{d}$ should approximate **d** up to

- a. 4 significant digits
- b. 2 significant digits
- c. 5 significant digits
- d. 1 significant digits
- e. 3 significant digits

The correct answer is: 2 significant digits

Question **4**

Correct

Mark 1.00 out of 1.00

Flag question

The function $g(x) = 1 + \frac{6}{x}$ on [1,4]

- a. has repulsive fixed point
- b. has no fixed points
- c. has a unique fixed point ✔
- d. has divergent fixed point iteration
- e. has two fixed points

The correct answer is:
has a unique fixed point

Question **5**

Correct

Mark 1.00 out of 1.00

Flag question

If the length of a tower is measured as $\tilde{d} = 120.06$ meter with relative error **0.0005**, then the actual length of the tower **d=**

- a. 122 meter
- b. 125 meter
- c. 120 meter ✔
- d. 118 meter
- e. 115 meter

The correct answer is: 120 meter

Quiz 2 from Pages 25 to 40.1

Question **1**

Correct

Mark 1.00 out of 1.00

Flag question

Using Secant Method with $P_0 = 1$ and $P_1 = 1.2$, the iteration P_2 that approximates the solution of $\cos x = \frac{x}{4}$ using 5 rounding digits is

- a. none
- b. 1.2546
- c. 1.2547 ✓
- d. 1.2544
- e. 1.2548
- f. 1.2545

The correct answer is:
1.2547

Question **2**

Correct

Mark 1.00 out of 1.00

Flag question

If the Bisection method is used to estimate the root of $\sin x - x^2 + 1 = 0$ on the interval [1, 2], then the third iteration is

- a. 1.4375
- b. 1.25
- c. 1.75
- d. 1.125
- e. 1.375 ✓
- f. none

The correct answer is:
1.375

Question **3**
Incorrect
Mark 0.00 out of 1.00
Flag question

Assume 1-b is the first iteration used by False Position Method to estimate the root of $f(x) = x^4 - x^3 - 2x + b$ on [0,1]. Then the value of b is

- a. $\frac{2}{3}$
- b. 1
- c. $\frac{3}{2}$ ✖
- d. 3
- e. none
- f. 2

The correct answer is:
$\frac{2}{3}$

Question **4**
Correct
Mark 1.00 out of 1.00
Flag question

Using Newton's Method with $P_0 = 1$, the approximated root of $\cos x = \frac{x}{4}$ using 3 chopping digits with error less than 0.03 is

- a. none
- b. 1.27
- c. 1.26
- d. 1.25 ✔
- e. 1.24
- f. 1.22

The correct answer is:
1.25

Question **5**
Incorrect
Mark 0.00 out of 1.00
Flag question

Let $g(x) = \sin(x+1)$. Assume the FPI is used with $P_0 = 0.5$ to estimate the fixed point on [0.2,1.5] using three digits rounding. Then the number of iterations needed to get accuracy 10^{-2} is at least

- a. 388 ✖
- b. 387
- c. 390
- d. none
- e. 391
- f. 389

The correct answer is:
none

Quiz 3 from Pages 41 - 58

Question **1**
Correct
Mark 1.00 out of 1.00
Flag question

If we use the secant method to estimate the root of $f(x) = (x-2)e^x$, then the order of convergence is

- a. 0.618
- b. 2
- c. 1.618 ✓
- d. none
- e. 1

The correct answer is:
1.618

Question **2**
Correct
Mark 1.00 out of 1.00
Flag question

If we use Newton iteration to estimate the root of $f(x) = (x-2)\ln(x-1)$, then the asymptotic error constant is

- a. $\frac{2}{3}$
- b. $\frac{1}{2}$ ✓
- c. 2
- d. $\frac{1}{3}$
- e. 1
- f. none

The correct answer is:
$\frac{1}{2}$

Question **3**

Correct

Mark 1.00 out of 1.00

Flag question

If A is 5×5 matrix, then the cost for calculating $|A|A^2$ is

- a. 225
- b. 324
- c. 255
- d. none
- e. 549
- f. 574 ✔
- g. 604

The correct answer is:
574

Question **4**

Correct

Mark 1.00 out of 1.00

Flag question

If Accelerated Newton method is used to approximate the root $x = 0$ of $f(x) = x^3 - x^2$ with $P_0 = 0.5$, then

- a. $P_1 = 1.5$
- b. none
- c. $P_1 = -1.5$
- d. $P_1 = -0.5$ ✔
- e. $P_1 = -1$
- f. $P_1 = 1$

The correct answer is:
$P_1 = -0.5$

Question **5**

Incorrect

Mark 0.00 out of 1.00

Flag question

If we use Newton iteration to estimate the root of $f(x) = (x-3)\ln(x-1)$, then the iteration converges

- a. none
- b. cubically
- c. quadratically
- d. linearly ✘

The correct answer is:
quadratically

Quiz 4 in Ch4 and Ch5

Question 1

Correct

Mark 1.00 out of 1.00

Flag question

Given $f(x) = \cos x$ on $[\frac{\pi}{6}, \frac{\pi}{2}]$. If **uniform partition** is used for interpolation then an upper bound for the Error Term E_2 is

Select one:

a. $\frac{\pi^3}{167454\sqrt{3}}$

b. $\frac{\pi^4}{157464}$

c. $\frac{\pi^3}{177454\sqrt{3}}$

d. $\frac{\pi^4}{176454}$

e. $\frac{\pi^3}{6561\sqrt{3}}$

f. $\frac{\pi^3}{1944\sqrt{3}}$ ✔

g. none

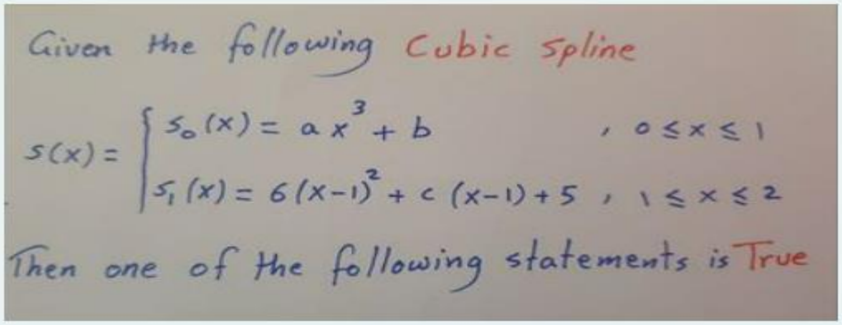
The correct answer is: $\frac{\pi^3}{1944\sqrt{3}}$

Question **2**

Correct

Mark 1.00 out of 1.00

Flag question



Select one:

- a. **s(x) is not natural and a=3, b=2, c=6**
- b. **s(x) is natural and a=2, b=3, c=6**
- c. **s(x) is natural and a=3, b=2, c=6**
- d. **s(x) is natural and a=3, b=6, c=2**
- e. **s(x) is not natural and a=2, b=3, c=6** ✔
- f. **s(x) is not natural and a=3, b=6, c=2**

The correct answer is: **s(x) is not natural and a=2, b=3, c=6**

Question **3**

Correct

Mark 1.00 out of 1.00

Flag question

Given the points $(0, 1)$, $(-1, 0)$, $(3, 16)$. The **Second Divided Differences** $f[0, -1, 3]$ is

Select one:

- a. 0
- b. $\frac{1}{3}$
- c. -3
- d. 1 ✔
- e. 3
- f. $-\frac{1}{3}$
- g. -1
- h. none

The correct answer is: 1

Question **4**

Correct

Mark 1.00 out of 1.00

Flag question

The **Root-Mean-Square Error** for the **linear** approximation of $f(x) = 1 + 3x$

to the data $(0, 0.8), (1, -1.8), (-1, 3)$ is

Select one:

- a. 0.36
- b. 0.6
- c. 0.67
- d. none
- e. 0.08
- f. 0.06
- g. 4.42 ✔
- h. 3.04

The correct answer is:
4.42

Question **5**

Correct

Mark 1.00 out of 1.00

Flag question

Given the points $(1, 1.10)$, $(2, 1.37)$, $(3, 1.61)$. The Lagrange coefficient $L_{2,2}(2.5)$ is

Select one:

- a. 0
- b. 0.357
- c. none ✖
- d. 0.573
- e. 0.735
- f. 0.537
- g. 0.375
- h. 0.753

The correct answer is:
0.375

Quiz 5 in Ch6

Question **1**

Correct

Mark 1.50 out of 1.50

Flag question

Let $f(x) = e^x \cos x$. The estimated value of $f'(2)$ using the backward difference formula of order [o(h^2)\] and step size $h = 1$ is

- a. **-5.25**
- b. **2.35**
- c. **-7.05**
- d. **4.65**
- e. **8.29**
- f. **3.79**
- g. **-6.83**
- h. **none**

The correct answer is:
-7.05

Question **2**

Correct

Mark 1.50 out of 1.50

Flag question

Consider the following points: (-2,-3), (-1,0), (0,2). The estimated value of $f'(-1)$ using the central difference formula of order $o(h^2)$ is

- a. -2.5
- b. -1.5
- c. 1.5
- d. none
- e. 1
- f. 0
- g. 2.5 ✔
- h. -1

The correct answer is:
2.5

Question **3**

Incorrect

Mark 0.00 out of 2.00

Flag question

Let $f(x) = \sin x$. If we estimate $f'(x_0)$ by the difference formula $f'(x_0) = \frac{f_0 - 3f_{-1} + 3f_{-2} - f_{-3}}{h^3} + \frac{3hf^{(4)}(c)}{2}$, then the optimal step size h will be

- a. none
- b. 0.095
- c. 0.0095
- d. 0.01
- e. 0.001 ✖
- f. 1
- g. 0.1
- h. 0.95

The correct answer is:
0.0095

1st Exam

BIRZEIT UNIVERSITY
Mathematics Department

Math 330

1st Exam — 2nd Semester 20/21

Student name: .... ID no.: ...... sec.......

(problems from 1 to 10, 4 points each)

(1) Using the bisection method with $a_0 = 4$, $b_0 = 5$ to estimate the solution of the equation $x^3 - 7x^2 + 15x = 19$, if $c_0 = 4.5$ Find the next 2 iterations c_1, c_2.

$f(x) = x^3 - 7x^2 + 15x - 19$

$f(4) = -7$, $f(5) = 6$

$f(4.5) = -2.125$

$[a_1, b_1] = [4.5, 5] \Rightarrow c_1 = 4.75$ (2)

$f(c_1) = 1.48..$

$[a_2, b_2] = [4.5, 4.75] \Rightarrow c_2 = 4.625$ (2)

(2) Using the False position method with $a_0 = 4$, $b_0 = 5$ to estimate the solution of the equation $x^3 - 7x^2 + 15x = 19$, If $c_0 = 4.6154$, Find the next iteration c_1.

$f(x) = x^3 - 7x^2 + 15x - 19$

$f(4.6154) = -0.5656$

$[a_1, b_1] = [4.6154, 5]$ (2)

$$c_1 = b_1 - \frac{f(b_1)(b_1 - a_1)}{f(b_1) - f(a_1)}$$

$$= 5 - \frac{6(0.3846)}{6 + 0.5656}$$

$$= 4.64853$$ (2)

3) Using Fixed point theorem, show why the function $g(x) = \sqrt[3]{2x+5}$ has a fixed point in the interval [2,3]

g(x) increasing

2 { $g(2) = \sqrt[3]{9} \approx 2.08 \in [2,3]$
$g(3) = \sqrt[3]{11} \approx 2.22 \in [2,3]$

2 { since g(x) increasing ⇒ $2 \le g(2) \le g(x) \le g(3) < 3$
⇒ $g(x) \in [2,3]$ ⇒ there exists a fixed point in [2,3]

4) Show why the fixed-point iteration generated by the function $g(x) = \sqrt[3]{2x+5}$ converges in the interval [2,3]

$g(x) = (2x+5)^{1/3}$

① $|g'(x)| = \frac{1}{3}(2x+5)^{-1/3} \cdot 2$

(3) right k $= \frac{2}{3\sqrt[3]{(2x+5)^2}} < \frac{2}{3}$ since $\sqrt[3]{(2x+5)^2} > 1$

by th, the iteration converges $\forall p_0 \in [2,3]$

(5) The point $p = 2$ is a fixed point of the function $g(x) = \frac{2}{x} + 1$. Show if it is attractive or repulsive and why.

2 { $g'(x) = \frac{-2}{x^2}$
$|g'(2)| = |-\frac{1}{2}| = \frac{1}{2} < 1$

2 [$p = 2$ is attractive FP.

6) The point $p = 3$ is a zero of the function $f(x) = x^3 - 7x^2 + 15x - 9$, Use Newton iteration to estimate the zero $p = 3$, starting with $p_0 = 3.2$ Find p_1, p_2

2 $P_1 = 3.10434...$

2 $P_2 = 3.0534...$

7) The point $p = 3$ is a zero of the function $f(x) = x^3 - 7x^2 + 15x - 9$, using Newton iteration to estimate the zero $p = 3$, Find the order of convergence R and the asymptotic error constant A.

$f(3) = 27 - 63 + 45 - 9 = 0$

$f'(x) = 3x^2 - 14x + 15$

$f'(3) = 27 - 42 + 15 = 0$

$f''(x) = 6x - 14$

$f''(3) = 4 \neq 0$

(2) $M = 2$ $R = 1$ $A = \frac{1}{2}$ (2)

8) The point $p = 2$ is a fixed point of the function $g(x) = \frac{x}{2} + \frac{2}{x}$

find the order of convergence of the fixed-point iteration generated by $g(x)$

$g(2) = 2$

$g'(x) = \frac{1}{2} - \frac{2}{x^2}$

(2) $g'(2) = 0$

$g''(x) = \frac{4}{x^3}$

(1) $g''(2) = \frac{1}{2} \neq 0$ $\Rightarrow R = 2$ (1)

9) If A is $n \times n$ matrix, what is the cost of calculating $3A^3 - 2A$

$A^2 \rightarrow n^2(2n-1) = 2n^3 - n^2$

$A^3 \rightarrow 2(2n^3 - n^2) = 4n^3 - 2n^2$ (2)

$3A^3 \rightarrow 4n^3 - 2n^2 + n^2$ --(1)

$2A \rightarrow n^2$ --(2)

$(1)+(2) \rightarrow n^2$

Total: $4n^3 - 2n^2 + n^2 + n^2 + n^2 = 4n^3 + n^2$ (2)

10)Consider the following system of equations

$$x = g_1(x, y, z) = 3x^2 - 2y^3 + 2z,$$
$$y = g_2(x, y, z) = 10 - 2xy - z^2$$
$$z = g_3(x, y, z) = 10z - 2xy$$

Use Gauss-Sidel iteration to find the 1st iteration given that the initial point is (3,2,4)

$p_1 = g_1(3,2,4) = 19$ (1)

$q_1 = g_2(19,2,4) = -82$ (1)

$r_1 = g_3(19,-82,4) = 3156$ (2)

This page each problem worth 5 points

11)Use newton method to find the 1st iteration of the following system

$$x = 3x^2 - y^3$$
$$y = 2y^2 - 2x$$

given that the initial estimation is (1.2, 3.4)

$f_1(x,y) = 3x^2 - y^3 - x$

$f_1(1.2, 3.4) = -36.184$ (1)

$f_2(x,y) = 2y^2 - 2x - y$

$f_2(1.2, 3.4) = 17.32$

$$J = \begin{pmatrix} 6x-1 & -3y^2 \\ -2 & 4y-1 \end{pmatrix}_{(1.2,\,3.4)}$$

$$= \begin{pmatrix} 6.2 & -34.68 \\ -2 & 12.6 \end{pmatrix}, \quad J^{-1} = \frac{1}{8.76}\begin{pmatrix} 12.6 & 34.68 \\ 2 & 6.2 \end{pmatrix}$$

$$\simeq \begin{pmatrix} 1.44 & 3.96 \\ 0.228 & 0.708 \end{pmatrix}$$ (2)

$$\begin{pmatrix} p_1 \\ q_1 \end{pmatrix} = \begin{pmatrix} 1.2 \\ 3.4 \end{pmatrix} - \begin{pmatrix} 1.44 & 3.96 \\ 0.228 & 0.708 \end{pmatrix}\begin{pmatrix} -36.184 \\ 17.32 \end{pmatrix} = \begin{pmatrix} -15.28 \\ -0.6126 \end{pmatrix}$$ (2)

12) Solve the following system of equations using Gaussian elimination with partial pivoting and three digits rounding

$$6.33x - 0.113\,y = 6.10$$
$$10.2\,x + 0.182y = 10.6$$

$$\left[\begin{array}{cc|c} 10.2 & 0.182 & 10.6 \\ 6.33 & -0.113 & 6.10 \end{array}\right] \quad m_{21} = \frac{6.33}{10.2} = 0.621$$

$$R_2 - 0.621R_1 \left[\begin{array}{cc|c} 10.2 & 0.182 & 10.6 \\ 0 & -0.226 & -0.48 \end{array}\right]$$ (3)

$x_2 = 2.12$

(2)

$x_1 = 1.00$

2nd Exam

Key

BIRZEIT UNIVERSITY

Name:______________ MATH 330 2nd Semester 2020-2021

Number:____________ Second Exam

Each problem worth 5 points

Q#1) Consider the function $f(x) = \frac{1}{x}$ and the data points

(0.1, 10), (0.2, 5), (0.3, 3.33)

Find Lagrange interpolating polynomial $P_2(x)$.

2 $P_2(x) = \frac{(x-x_1)(x-x_2)}{(x_0-x_1)(x_0-x_2)} y_0 + \frac{(x-x_0)(x-x_2)}{(x_1-x_0)(x_1-x_2)} y_1 + \frac{(x-x_0)(x-x_1)}{(x_2-x_0)(x_2-x_1)} y_2$

3 $= \frac{(x-0.2)(x-0.3)}{(-0.1)(-0.2)}(10) + \frac{(x-0.1)(x-0.3)}{(0.1)(-0.1)}(5) + \frac{(x-0.1)(x-0.2)}{(0.2)(0.1)}(3.33)$

$= 500(x-0.2)(x-0.3) - 500(x-0.1)(x-0.3) + 166.5(x-0.1)(x-0.2)$

Q#2) Find an upper bound for the error in the above estimation (in problem 1).

$|E_2(x)| \le \frac{h^3 M_3}{9\sqrt{3}}$

(3) $\le \frac{(0.1)^3(60{,}000)}{9\sqrt{3}}$

$\le \frac{60}{9\sqrt{3}} \simeq 3.85$

$f(x) = x^{-1}$

$f'(x) = -x^{-2}$

$f''(x) = 2x^{-3}$

$|f'''(x)| = |-6x^{-4}|$

$= \frac{6}{x_0^4}$

(2) $M_3 = \frac{6}{(0.1)^4} = 60{,}000$

1

Q#3) Consider the function $f(x) = x^3 - 3x$ and the data points

(0., 0), (1, -2), (2,2), (3,18)

Find Newton interpolating polynomial $P_3(x)$. Don't Simplify.

x_k	y_k	1st diff	2nd diff	3rd diff.
0	0	///	///	///
1	−2	−2	///	///
2	2	4	3	///
3	18	16	6	1

$a_0 = 0$
$a_1 = -2$
$a_2 = 3$
$a_3 = 1$

(3)

$$P_3(x) = a_0 + a_1(x - x_0) + a_2(x - x_0)(x - x_1) + a_3(x - x_0)(x - x_1)(x - x_2)$$

$$= 0 - 2(x-0) + 3(x-0)(x-1) + 1(x)(x-1)(x-2)$$

(2)

$$= -2x + 3x(x-1) + x(x-1)(x-2)$$

Q#4) Without simplifying $P_3(x)$) in the above estimation (in Q#3) ,what is the relation between $P_3(x)$ and $f(x)$. Explain

$P_3(x) = f(x)$, for all x, since

(5)

$$E_3(x) = \frac{(x-0)(x-1)(x-2)(x-3)}{4!} f^{(4)}(c)$$

$f^{(4)}(c) = 0$

$= 0$

Q#5) Derive the normal equations for the best fit of the form $f(x) = Ax^3 + Bx$

$$E(A,B) = \sum_{k=1}^{n} (f(x_k) - y_k)^2 = \sum_{k=1}^{n} (A x_k^3 + B x_k - y_k)^2$$

2 $$\frac{\partial E}{\partial A} = 0 = \sum_{k=1}^{n} 2(A x_k^3 + B x_k - y_k) \cdot x_k^3$$

1 $$A \sum_{k=1}^{n} x_k^6 + B \sum_{k=1}^{n} x_k^4 = \sum_{k=1}^{n} y_k x_k^3 \quad \text{---(1)}$$

2 $$\frac{\partial E}{\partial B} = 0 = \sum_{k=1}^{n} 2(A x_k^3 + B x_k - y_k) \cdot x_k$$

1 $$A \sum_{k=1}^{n} x_k^4 + B \sum_{k=1}^{n} x_k^2 = \sum_{k=1}^{n} y_k x_k \quad \text{---(2)}$$

Q#6) Find A, B using the normal equations derived above (in Q#5) and the following data.

$$(1,-2), (2,2), (3,18)$$

x_k	y_k	x_k^2	x_k^3	x_k^4	x_k^6	$y_k x_k$	$y_k x_k^3$
1	-2	1	1	1	1	-2	-2
2	2	4	8	16	64	4	16
3	18	9	27	64	729	54	486
Total		14	36	98	794	56	500

(3)

$$794A + 98B = 500$$
$$98A + 14B = 56$$

(2)

$$A = \frac{\begin{vmatrix} 500 & 794 \\ 56 & 14 \end{vmatrix}}{\begin{vmatrix} 794 & 98 \\ 98 & 14 \end{vmatrix}} = \frac{1512}{1512} = 1, \quad B = \frac{\begin{vmatrix} 794 & 500 \\ 98 & 56 \end{vmatrix}}{1512} = \frac{-4536}{1512} = -3$$

Q#7) compare the maximum error, average error, and RMS error for the approximation $f(x) = x^3 - 3x$ to the data points(0., 1), (1, −3), (2,5), (3,15).

x_k	y_k	$f(x_k)$	$\lvert e_k \rvert$	$\lvert e_k \rvert^2$
0	1	0	1	1
1	−3	−2	1	1
2	5	2	3	9
3	15	18	3	9
Total			8	20

2 Max error $= E_\infty(f) = 3$

2 Average error $= E_1(f) = \frac{8}{4} = 2$

2 RMS error $= E_2(f) = \left(\frac{20}{4}\right)^{1/2} = \sqrt{5}$

Q#8) Find a suitable Linearization for $f(x) = Cx + Dx^3$ (Don't find C, D)

$y = Cx + Dx^3$

$\frac{y}{x} = Dx^2 + C$

$Y = AX + B$

(3) $\left.\begin{array}{l} Y = \frac{y}{x} \\ X = x^2 \end{array}\right\} \Rightarrow A, B$

(2) $\Rightarrow D = A$

$\Rightarrow C = B$

4

Q#9) find the clamped cubic spline that interpolates the data (1 , −1), (3,22),

$f'(1) = 0$, $f'(3) = 24$

$g(x) = a_0(x-1)^3 + b_0(x-1)^2 + c_0(x-1) + d_0$

(1) $g(1) = -1 \Rightarrow d_0 = -1$

$g(3) = 22 \Rightarrow 8a_0 + 4b_0 + 2c_0 - 1 = 22$

$g'(x) = 3a_0(x-1)^2 + 2b_0(x-1) + c_0$

(1) $g'(1) = 0 = c_0$

$g'(3) = 24 = 12a_0 + 4b_0$

(2) $8a_0 + 4b_0 = 23$

$12a_0 + 4b_0 = 24$

$4a_0 = 1 \Rightarrow a_0 = \frac{1}{4}$

(2) $8(\frac{1}{4}) + 4b_0 = 23 \Rightarrow b_0 = \frac{21}{4}$

$4b_0 = 21$

$g(x) = \frac{1}{4}(x-1)^3 + \frac{21}{4}(x-1)^2 - 1$

Q#10) For the the data (1,2), (3,4), (5,2)

x_0 x_1 x_2

if $L_{2,1}(x) = \frac{3}{4}$ Find x?

(1) $L_{2,1}(x) = \frac{(x-x_0)(x-x_2)}{(x_1-x_0)(x_1-x_2)}$

(2) $\frac{(x-1)(x-5)}{(3-1)(3-5)} = \frac{3}{4}$

$\frac{(x-1)(x-5)}{(2)(-2)} = \frac{3}{4}$

$x^2 - 6x + 5 = -3$

$x^2 - 6x + 8 = 0$

$(x-2)(x-4) = 0$ (2)

$x = 2, 4$

5

Final Exam

جامعة بيرزيت

BIRZEIT UNIVERSITY

Mathematics Department

Math 330

Final Exam | 2nd Semester 20/21

Student name: …………………… ID no.: …… sec……..

Circle your final Answer, You should show how you get the answer, we will only grade the supported answer, Each problem worth 3points

1) Using four digits arithmetic and rounding, Find the value of

$$\frac{7}{17}+\frac{81}{13}+\frac{801}{19}$$

Answer=

2) When using the bisection method to estimate the solution of the equation $f(x) = 0$ on the interval [4,6], find the number of iterations needed to get accuracy 10^{-5}.

Answer=

3) Use the secant method with $p_0 = 1$, $p_1 = 1.5$ to estimate the solution of the equation $x^5 = x + 4$, Find the next iteration.

Answer=

(4) Find the repulsive fixed point of $g(x) = \frac{10}{x} + 3$

Answer=

5) Find the order of convergence of the following sequence of numbers that converges to p=1, Prove your answer numerically

$$p_0 = 1.2000000000$$
$$p_1 = 1.006060606$$
$$p_2 = 1.000006087$$
$$p_3 = 1.000000000$$

Answer=

6) When estimating the roots of the function $f(x) = (x+3)^3(x-1)$ using Newton Method, find the asymptotic error constant A for $p = 1$

Answer=

7) Find the point on the parabola $y = x^3$ that is closest to the point (1, 2) with two digits accuracy of the x coordinate.

Answer=

8) Using a table, Find $f\ [1.3,\ 2.4,\ 3.6]\ where\ f(x) = x^2$

Answer=

9) Find $L_{3,2}(5)$ using the nodes

$$x_0 = 3\ , x_1 = 4, x_2 = 6\ , x_3 = 8$$

Answer=

10) Find the cost of evaluating $p_2(x)$, for a specific x, where $p_2(x)$ is the Lagrange interpolating polynomial

.

Answer=

11) Find the best upper bound for the error when using Newton polynomial $p_3(x)$to estimate $f(x) = ln(x + 1)$ in the interval [0.1,0.4] and using uniform partition.

Answer=

12) If the following is a cubic spline over [0, 2]

$$S(x) = \left\{ \begin{array}{ll} -2x^3 + 2x^2 + ax + 1\ , & 0 \leq x \leq 1 \\ 7(x-1)^3 - 4(x-1)^2 + b\,(x-1) + 1\ , & 1 < x \leq 2 \end{array} \right\}$$

Find a and b

Answer=

13)- Consider the following formula

$$f''(x_0) = \frac{f_3 - 4f_0 + 3f_{-1}}{6h^2} - \frac{2hf'''(c)}{3}$$

Find the optimal h

Answer=

(14) Approximate $\int_{-1}^{1} x^2 e^{x^2} dx$

Using Simpson's rule

Answer=

15)- Estimate $f'(4)$,and $f''(4)$ using central difference formulas of order $o(h^2)$ for the data (0,1), (2,4), (4,6), (6,9)

Answer=

16)- Consider the quadrature formula

$$\int_{-6}^{6} f(x)dx \cong Af(-6) + Bf(6)$$

If the degree of precession is 1, Find A, B

Answer=

17) - Consider the quadrature formula

$$\int_{-1}^{1} f(x)dx \cong \frac{4}{5}f\left(-\frac{1}{2}\right) + \frac{6}{5}f\left(\frac{1}{3}\right)$$

If the degree of precession is 1, Find the truncation error.

Answer=

Good Luck