King Fahd University of Petroleum and Minerals
Department of Mathematics

Math 371
Major Exam I
251
September 28, 2025

EXAM COVER

Number of versions: 4
Number of questions: 14

King Fahd University of Petroleum and Minerals
Department of Mathematics

Math 371

Major Exam I

251

September 28, 2025

Net Time Allowed: 90 Minutes

MASTER VERSION

1. Let $P_2(x)$ be the second Taylor polynomial of $f(x) = e^x \cos x$ about $x_0 = 0$. Then the least upper bound for $|f(x) - P_2(x)|$ in the interval $[0, 1]$ is

   (a) 1.252 ______________________________ (correct)

   (b) 1.821

   (c) 1.485

   (d) 1.036

   (e) 1.360

2. Let

$$f(x) = \frac{e^x - e^{-x}}{x}$$

   Use three-digit rounding arithmetic to compute $f(0.1)$

   (a) 2.05 ______________________________ (correct)

   (b) 2.25

   (c) 2.003

   (d) 2.03

   (e) 2.15

3. The bound of number of iterations using bisection method needed to achieve an approximation with accuracy 10^{-3} to the solution of $x^3 + x - 4 = 0$ lying in the interval $[1, 4]$ is

   (a) $n \geq 12$ ____(correct)

   (b) $n \geq 3$

   (c) $n \geq 10$

   (d) $n \geq 5$

   (e) $n \geq 15$

4. The bisection method converges to which of the zero of $f(x) = (x+2)(x+1)x(x-1)^3(x-2)$ in the interval $[-1.75, 1.5]$

   (a) -1 ____(correct)

   (b) 1

   (c) 0

   (d) 2

   (e) -2

5. Using the fixed-point iteration $x_{n+1} = g(x_n)$ to compute $\alpha = \sqrt[3]{21}$, which of the following functions does **not** converge to α for any initial guess $x_0 \in [2,3]$? Assume each g is well-defined and differentiable on $[2,3]$.

(a) $g(x) = \dfrac{x^3 - x^4}{x^2 - 21}$ ________________ (correct)

(b) $g(x) = x - \dfrac{x^3 - 21}{3x^2}$

(c) $g(x) = \dfrac{20}{21}x + \dfrac{1}{x^2}$

(d) $g(x) = \dfrac{\sqrt{21}}{x^{1/2}}$

(e) $g(x) = x - \dfrac{x^3 - 21}{30}$

6. Using Newton's method with initial guess $p_0 = 1.5$ to approximate a root of $f(x) = x^2 - 4x + 4 - \ln x$ accurate to within 10^{-3}

(a) 1.4123911717 ________________ (correct)

(b) 1.4506567213

(c) 1.4067209351

(d) 1.2383198213

(e) 1.7090412323

7. Using the secant method, find p_3 for $f(x) = x^2 - 6$ with initial guesses $p_0 = 3$ and $p_1 = 2$.

   (a) $p_3 = 2.45454$ ______________________________ (correct)
   (b) $p_3 = 2.55456$
   (c) $p_3 = 2.4$
   (d) $p_3 = 2.35344$
   (e) $p_3 = 2.3$

8. Let $P_2(x)$ be the quadratic Lagrange interpolant to $f(x) = \ln x$ at the nodes $x_0 = 1,\ x_1 = 1.1,\ x_2 = 1.3$. Find the smallest bound for $|f(1.2) - P_2(1.2)|$.

   (a) 6.67×10^{-4} ______________________________ (correct)
   (b) 3.03×10^{-4}
   (c) 3.33×10^{-4}
   (d) 1.33×10^{-3}
   (e) 4.43×10^{-3}

9. If the Natural cubic spline

$$S(x) = \begin{cases} S_0(x) = a_0 + b_0x + c_0x^2 + d_0x^3 & \text{if } x \in [0,1] \\ S_1(x) = a_1 + b_1(x-1) + c_1(x-1)^2 + d_1(x-1)^3 & \text{if } x \in [1,2] \end{cases}$$

interpolate the data $(0,0), (1,1), (2,2)$, then $a_0 + b_0 + a_1b_1 + 2c_0c_1 + d_1 =$

(a) 2 ______________________________ (correct)

(b) 3

(c) 1

(d) 0

(e) 4

10. Let $f(0.5) = 0.4794$, $f(0.6) = 0.5646$, $f(0.7) = 0.6442$. Using the most accurate 3−point formulas, the sum $f'(0.5) + f'(0.6)$ is equal to

(a) 1.7040 ______________________________ (correct)

(b) 0.8800

(c) 0.8420

(d) 0.7860

(e) 1.6480

11. Consider the following table of data

x	0.2	0.4	0.6	0.8	1.0
$f(x)$	0.9798652	0.9177710	0.808038	0.6386093	0.3843735

Using a step size $h = 0.2$, $f''(0.6) \approx$

(a) -1.4924 ______________________________ (correct)

(b) -1.4652

(c) 1.4924

(d) -5.9696

(e) -0.3731

12. Use the composite Trapezoidal rule with $n = 4$ equal subintervals to approximate

$$\int_{-2}^{2} x^3 e^x \, dx$$

Which of the following is the resulting approximation?

(a) 31.3653 ______________________________ (correct)

(b) 22.4771

(c) 19.9207

(d) 14.5068

(e) 11.2018

13. The minimum value of n required to approximate the integral

$$\int_0^2 \frac{1}{x+4} dx$$

to within 10^{-5} using composite Simpson's rule is

(a) 6 ______________________________ (correct)
(b) 5
(c) 4
(d) 3
(e) 2

14. Suppose p^* is used to approximate the number 5, with relative error at most 10^{-3}. Find the largest interval in which p^* must lie.

(a) $[4.995, 5.005]$ ______________________________ (correct)
(b) $[4.999, 5.001]$
(c) $[4.95, 5.05]$
(d) $[-5.005, -4.995]$
(e) $[4.990, 5.010]$

King Fahd University of Petroleum and Minerals
Department of Mathematics

CODE01 **CODE01**

Math 371
Major Exam I
251
September 28, 2025
Net Time Allowed: 90 Minutes

Name	
ID		**Sec**	

Check that this exam has 14 questions.

Important Instructions:

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8. When erasing a bubble, make sure that you do not leave any trace of penciling.

1. If the Natural cubic spline

$$S(x) = \begin{cases} S_0(x) = a_0 + b_0x + c_0x^2 + d_0x^3 & \text{if } x \in [0,1] \\ S_1(x) = a_1 + b_1(x-1) + c_1(x-1)^2 + d_1(x-1)^3 & \text{if } x \in [1,2] \end{cases}$$

interpolate the data $(0,0),(1,1),(2,2)$, then $a_0 + b_0 + a_1b_1 + 2c_0c_1 + d_1 =$

(a) 0
(b) 4
(c) 2
(d) 3
(e) 1

2. Consider the following table of data

x	0.2	0.4	0.6	0.8	1.0
$f(x)$	0.9798652	0.9177710	0.808038	0.6386093	0.3843735

Using a step size $h = 0.2$, $f''(0.6) \approx$

(a) -1.4924
(b) -5.9696
(c) -0.3731
(d) -1.4652
(e) 1.4924

3. Let

$$f(x) = \frac{e^x - e^{-x}}{x}$$

Use three-digit rounding arithmetic to compute $f(0.1)$

(a) 2.003
(b) 2.05
(c) 2.25
(d) 2.15
(e) 2.03

4. Use the composite Trapezoidal rule with $n = 4$ equal subintervals to approximate

$$\int_{-2}^{2} x^3 e^x \, dx$$

Which of the following is the resulting approximation?

(a) 11.2018
(b) 22.4771
(c) 19.9207
(d) 31.3653
(e) 14.5068

5. The minimum value of n required to approximate the integral

$$\int_0^2 \frac{1}{x+4}dx$$

to within 10^{-5} using composite Simpson's rule is

(a) 2
(b) 3
(c) 6
(d) 5
(e) 4

6. Suppose p^* is used to approximate the number 5, with relative error at most 10^{-3}. Find the largest interval in which p^* must lie.

(a) $[4.95, 5.05]$
(b) $[-5.005, -4.995]$
(c) $[4.999, 5.001]$
(d) $[4.995, 5.005]$
(e) $[4.990, 5.010]$

7. Using Newton's method with initial guess $p_0 = 1.5$ to approximate a root of $f(x) = x^2 - 4x + 4 - \ln x$ accurate to within 10^{-3}

   (a) 1.7090412323
   (b) 1.4067209351
   (c) 1.2383198213
   (d) 1.4123911717
   (e) 1.4506567213

8. The bisection method converges to which of the zero of $f(x) = (x+2)(x+1)x(x-1)^3(x-2)$ in the interval $[-1.75, 1.5]$

   (a) 0
   (b) -1
   (c) 2
   (d) -2
   (e) 1

9. Using the fixed-point iteration $x_{n+1} = g(x_n)$ to compute $\alpha = \sqrt[3]{21}$, which of the following functions does **not** converge to α for any initial guess $x_0 \in [2, 3]$? Assume each g is well-defined and differentiable on $[2, 3]$.

(a) $g(x) = x - \dfrac{x^3 - 21}{30}$

(b) $g(x) = x - \dfrac{x^3 - 21}{3x^2}$

(c) $g(x) = \dfrac{\sqrt{21}}{x^{1/2}}$

(d) $g(x) = \dfrac{20}{21}x + \dfrac{1}{x^2}$

(e) $g(x) = \dfrac{x^3 - x^4}{x^2 - 21}$

10. Let $P_2(x)$ be the second Taylor polynomial of $f(x) = e^x \cos x$ about $x_0 = 0$. Then the least upper bound for $|f(x) - P_2(x)|$ in the interval $[0, 1]$ is

(a) 1.036

(b) 1.821

(c) 1.252

(d) 1.485

(e) 1.360

11. Using the secant method, find p_3 for $f(x) = x^2 - 6$ with initial guesses $p_0 = 3$ and $p_1 = 2$.

   (a) $p_3 = 2.3$
   (b) $p_3 = 2.4$
   (c) $p_3 = 2.45454$
   (d) $p_3 = 2.35344$
   (e) $p_3 = 2.55456$

12. Let $f(0.5) = 0.4794$, $f(0.6) = 0.5646$, $f(0.7) = 0.6442$. Using the most accurate $3-$point formulas, the sum $f'(0.5) + f'(0.6)$ is equal to

   (a) 0.8800
   (b) 1.6480
   (c) 0.8420
   (d) 1.7040
   (e) 0.7860

13. The bound of number of iterations using bisection method needed to achieve an approximation with accuracy 10^{-3} to the solution of $x^3 + x - 4 = 0$ lying in the interval $[1, 4]$ is

(a) $n \geq 15$

(b) $n \geq 12$

(c) $n \geq 10$

(d) $n \geq 3$

(e) $n \geq 5$

14. Let $P_2(x)$ be the quadratic Lagrange interpolant to $f(x) = \ln x$ at the nodes $x_0 = 1,\ x_1 = 1.1,\ x_2 = 1.3$. Find the smallest bound for $|f(1.2) - P_2(1.2)|$.

(a) 3.33×10^{-4}

(b) 1.33×10^{-3}

(c) 6.67×10^{-4}

(d) 4.43×10^{-3}

(e) 3.03×10^{-4}

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Department of Mathematics

CODE02 **CODE02**

Math 371
Major Exam I
251
September 28, 2025
Net Time Allowed: 90 Minutes

Name	

ID		**Sec**	

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7. When bubbling, make sure that the bubbled space is fully covered.
8. When erasing a bubble, make sure that you do not leave any trace of penciling.

1. The bisection method converges to which of the zero of $f(x) = (x+2)(x+1)x(x-1)^3(x-2)$ in the interval $[-1.75, 1.5]$

   (a) -1
   (b) 2
   (c) 1
   (d) -2
   (e) 0

2. The bound of number of iterations using bisection method needed to achieve an approximation with accuracy 10^{-3} to the solution of $x^3 + x - 4 = 0$ lying in the interval $[1, 4]$ is

   (a) $n \geq 5$
   (b) $n \geq 10$
   (c) $n \geq 15$
   (d) $n \geq 3$
   (e) $n \geq 12$

3. Use the composite Trapezoidal rule with $n = 4$ equal subintervals to approximate

$$\int_{-2}^{2} x^3 e^x \, dx$$

Which of the following is the resulting approximation?

(a) 11.2018
(b) 31.3653
(c) 22.4771
(d) 14.5068
(e) 19.9207

4. Using the secant method, find p_3 for $f(x) = x^2 - 6$ with initial guesses $p_0 = 3$ and $p_1 = 2$.

(a) $p_3 = 2.55456$
(b) $p_3 = 2.35344$
(c) $p_3 = 2.3$
(d) $p_3 = 2.45454$
(e) $p_3 = 2.4$

5. Using the fixed-point iteration $x_{n+1} = g(x_n)$ to compute $\alpha = \sqrt[3]{21}$, which of the following functions does **not** converge to α for any initial guess $x_0 \in [2, 3]$? Assume each g is well-defined and differentiable on $[2, 3]$.

(a) $g(x) = \dfrac{20}{21}x + \dfrac{1}{x^2}$

(b) $g(x) = x - \dfrac{x^3 - 21}{3x^2}$

(c) $g(x) = \dfrac{\sqrt{21}}{x^{1/2}}$

(d) $g(x) = \dfrac{x^3 - x^4}{x^2 - 21}$

(e) $g(x) = x - \dfrac{x^3 - 21}{30}$

6. Let $P_2(x)$ be the quadratic Lagrange interpolant to $f(x) = \ln x$ at the nodes $x_0 = 1$, $x_1 = 1.1$, $x_2 = 1.3$. Find the smallest bound for $|f(1.2) - P_2(1.2)|$.

(a) 6.67×10^{-4}

(b) 3.33×10^{-4}

(c) 1.33×10^{-3}

(d) 4.43×10^{-3}

(e) 3.03×10^{-4}

7. Let $f(0.5) = 0.4794$, $f(0.6) = 0.5646$, $f(0.7) = 0.6442$. Using the most accurate 3−point formulas, the sum $f'(0.5) + f'(0.6)$ is equal to

   (a) 0.7860
   (b) 0.8420
   (c) 1.7040
   (d) 0.8800
   (e) 1.6480

8. Suppose p^* is used to approximate the number 5, with relative error at most 10^{-3}. Find the largest interval in which p^* must lie.

   (a) $[4.999, 5.001]$
   (b) $[4.995, 5.005]$
   (c) $[-5.005, -4.995]$
   (d) $[4.95, 5.05]$
   (e) $[4.990, 5.010]$

9. If the Natural cubic spline

$$S(x) = \begin{cases} S_0(x) = a_0 + b_0 x + c_0 x^2 + d_0 x^3 & \text{if } x \in [0,1] \\ S_1(x) = a_1 + b_1(x-1) + c_1(x-1)^2 + d_1(x-1)^3 & \text{if } x \in [1,2] \end{cases}$$

interpolate the data $(0,0), (1,1), (2,2)$, then $a_0 + b_0 + a_1 b_1 + 2c_0 c_1 + d_1 =$

(a) 1
(b) 3
(c) 4
(d) 0
(e) 2

10. Let

$$f(x) = \frac{e^x - e^{-x}}{x}$$

Use three-digit rounding arithmetic to compute $f(0.1)$

(a) 2.25
(b) 2.003
(c) 2.15
(d) 2.03
(e) 2.05

11. The minimum value of n required to approximate the integral

$$\int_0^2 \frac{1}{x+4}dx$$

to within 10^{-5} using composite Simpson's rule is

(a) 4
(b) 6
(c) 5
(d) 3
(e) 2

12. Let $P_2(x)$ be the second Taylor polynomial of $f(x) = e^x \cos x$ about $x_0 = 0$. Then the least upper bound for $|f(x) - P_2(x)|$ in the interval $[0, 1]$ is

(a) 1.360
(b) 1.252
(c) 1.821
(d) 1.485
(e) 1.036

13. Consider the following table of data

x	0.2	0.4	0.6	0.8	1.0
$f(x)$	0.9798652	0.9177710	0.808038	0.6386093	0.3843735

Using a step size $h = 0.2$, $f''(0.6) \approx$

(a) -0.3731
(b) -1.4924
(c) -5.9696
(d) 1.4924
(e) -1.4652

14. Using Newton's method with initial guess $p_0 = 1.5$ to approximate a root of $f(x) = x^2 - 4x + 4 - \ln x$ accurate to within 10^{-3}

(a) 1.7090412323
(b) 1.4067209351
(c) 1.4123911717
(d) 1.2383198213
(e) 1.4506567213

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CODE03 **CODE03**

Math 371
Major Exam I
251
September 28, 2025
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Name			
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1. The bound of number of iterations using bisection method needed to achieve an approximation with accuracy 10^{-3} to the solution of $x^3 + x - 4 = 0$ lying in the interval $[1, 4]$ is

   (a) $n \geq 5$
   (b) $n \geq 12$
   (c) $n \geq 15$
   (d) $n \geq 10$
   (e) $n \geq 3$

2. Let

   $$f(x) = \frac{e^x - e^{-x}}{x}$$

   Use three-digit rounding arithmetic to compute $f(0.1)$

   (a) 2.25
   (b) 2.15
   (c) 2.003
   (d) 2.05
   (e) 2.03

3. If the Natural cubic spline

$$S(x) = \begin{cases} S_0(x) = a_0 + b_0 x + c_0 x^2 + d_0 x^3 & \text{if } x \in [0,1] \\ S_1(x) = a_1 + b_1(x-1) + c_1(x-1)^2 + d_1(x-1)^3 & \text{if } x \in [1,2] \end{cases}$$

interpolate the data $(0,0),(1,1),(2,2)$, then $a_0 + b_0 + a_1 b_1 + 2c_0 c_1 + d_1 =$

(a) 4
(b) 3
(c) 2
(d) 1
(e) 0

4. Using Newton's method with initial guess $p_0 = 1.5$ to approximate a root of $f(x) = x^2 - 4x + 4 - \ln x$ accurate to within 10^{-3}

(a) 1.2383198213
(b) 1.4506567213
(c) 1.7090412323
(d) 1.4123911717
(e) 1.4067209351

5. Let $f(0.5) = 0.4794$, $f(0.6) = 0.5646$, $f(0.7) = 0.6442$. Using the most accurate 3−point formulas, the sum $f'(0.5) + f'(0.6)$ is equal to

   (a) 0.8420

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   (c) 0.7860

   (d) 1.7040

   (e) 1.6480

6. Let $P_2(x)$ be the quadratic Lagrange interpolant to $f(x) = \ln x$ at the nodes $x_0 = 1$, $x_1 = 1.1$, $x_2 = 1.3$. Find the smallest bound for $|f(1.2) - P_2(1.2)|$.

   (a) 3.03×10^{-4}

   (b) 4.43×10^{-3}

   (c) 6.67×10^{-4}

   (d) 3.33×10^{-4}

   (e) 1.33×10^{-3}

7. Suppose p^* is used to approximate the number 5, with relative error at most 10^{-3}. Find the largest interval in which p^* must lie.

   (a) $[-5.005, -4.995]$
   (b) $[4.990, 5.010]$
   (c) $[4.999, 5.001]$
   (d) $[4.995, 5.005]$
   (e) $[4.95, 5.05]$

8. Using the secant method, find p_3 for $f(x) = x^2 - 6$ with initial guesses $p_0 = 3$ and $p_1 = 2$.

   (a) $p_3 = 2.45454$
   (b) $p_3 = 2.3$
   (c) $p_3 = 2.4$
   (d) $p_3 = 2.35344$
   (e) $p_3 = 2.55456$

9. Consider the following table of data

x	0.2	0.4	0.6	0.8	1.0
$f(x)$	0.9798652	0.9177710	0.808038	0.6386093	0.3843735

Using a step size $h = 0.2$, $f''(0.6) \approx$

(a) 1.4924
(b) -0.3731
(c) -1.4924
(d) -1.4652
(e) -5.9696

10. The bisection method converges to which of the zero of $f(x) = (x+2)(x+1)x(x-1)^3(x-2)$ in the interval $[-1.75, 1.5]$

(a) -1
(b) 1
(c) 2
(d) 0
(e) -2

11. Using the fixed-point iteration $x_{n+1} = g(x_n)$ to compute $\alpha = \sqrt[3]{21}$, which of the following functions does **not** converge to α for any initial guess $x_0 \in [2, 3]$? Assume each g is well-defined and differentiable on $[2, 3]$.

(a) $g(x) = x - \dfrac{x^3 - 21}{3x^2}$

(b) $g(x) = \dfrac{x^3 - x^4}{x^2 - 21}$

(c) $g(x) = \dfrac{\sqrt{21}}{x^{1/2}}$

(d) $g(x) = x - \dfrac{x^3 - 21}{30}$

(e) $g(x) = \dfrac{20}{21}x + \dfrac{1}{x^2}$

12. Use the composite Trapezoidal rule with $n = 4$ equal subintervals to approximate

$$\int_{-2}^{2} x^3 e^x \, dx$$

Which of the following is the resulting approximation?

(a) 14.5068

(b) 31.3653

(c) 11.2018

(d) 22.4771

(e) 19.9207

13. Let $P_2(x)$ be the second Taylor polynomial of $f(x) = e^x \cos x$ about $x_0 = 0$. Then the least upper bound for $|f(x) - P_2(x)|$ in the interval $[0, 1]$ is

(a) 1.036
(b) 1.360
(c) 1.821
(d) 1.485
(e) 1.252

14. The minimum value of n required to approximate the integral

$$\int_0^2 \frac{1}{x+4} dx$$

to within 10^{-5} using composite Simpson's rule is

(a) 5
(b) 2
(c) 6
(d) 3
(e) 4

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Department of Mathematics

CODE04 **CODE04**

Math 371
Major Exam I
251
September 28, 2025
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Name	

ID		**Sec**	

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5. When bubbling your ID number and Section number, be sure that the bubbles match with the numbers that you write.
6. The Test Code Number is already bubbled in your answer sheet. Make sure that it is the same as that printed on your question paper.
7. When bubbling, make sure that the bubbled space is fully covered.
8. When erasing a bubble, make sure that you do not leave any trace of penciling.

1. Let $P_2(x)$ be the second Taylor polynomial of $f(x) = e^x \cos x$ about $x_0 = 0$. Then the least upper bound for $|f(x) - P_2(x)|$ in the interval $[0, 1]$ is

   (a) 1.036
   (b) 1.360
   (c) 1.821
   (d) 1.252
   (e) 1.485

2. The minimum value of n required to approximate the integral

$$\int_0^2 \frac{1}{x+4} dx$$

   to within 10^{-5} using composite Simpson's rule is

   (a) 5
   (b) 6
   (c) 2
   (d) 3
   (e) 4

3. Suppose p^* is used to approximate the number 5, with relative error at most 10^{-3}. Find the largest interval in which p^* must lie.

   (a) $[4.995, 5.005]$
   (b) $[4.990, 5.010]$
   (c) $[-5.005, -4.995]$
   (d) $[4.999, 5.001]$
   (e) $[4.95, 5.05]$

4. Using Newton's method with initial guess $p_0 = 1.5$ to approximate a root of $f(x) = x^2 - 4x + 4 - \ln x$ accurate to within 10^{-3}

   (a) 1.4067209351
   (b) 1.2383198213
   (c) 1.4123911717
   (d) 1.4506567213
   (e) 1.7090412323

5. Let $P_2(x)$ be the quadratic Lagrange interpolant to $f(x) = \ln x$ at the nodes $x_0 = 1$, $x_1 = 1.1$, $x_2 = 1.3$. Find the smallest bound for $|f(1.2) - P_2(1.2)|$.

(a) 1.33×10^{-3}
(b) 3.33×10^{-4}
(c) 4.43×10^{-3}
(d) 6.67×10^{-4}
(e) 3.03×10^{-4}

6. Consider the following table of data

x	0.2	0.4	0.6	0.8	1.0
$f(x)$	0.9798652	0.9177710	0.808038	0.6386093	0.3843735

Using a step size $h = 0.2$, $f''(0.6) \approx$

(a) 1.4924
(b) -1.4652
(c) -1.4924
(d) -5.9696
(e) -0.3731

7. If the Natural cubic spline

$$S(x) = \begin{cases} S_0(x) = a_0 + b_0 x + c_0 x^2 + d_0 x^3 & \text{if } x \in [0,1] \\ S_1(x) = a_1 + b_1(x-1) + c_1(x-1)^2 + d_1(x-1)^3 & \text{if } x \in [1,2] \end{cases}$$

interpolate the data $(0,0), (1,1), (2,2)$, then $a_0 + b_0 + a_1 b_1 + 2c_0 c_1 + d_1 =$

(a) 2
(b) 0
(c) 3
(d) 4
(e) 1

8. Use the composite Trapezoidal rule with $n = 4$ equal subintervals to approximate

$$\int_{-2}^{2} x^3 e^x \, dx$$

Which of the following is the resulting approximation?

(a) 22.4771
(b) 19.9207
(c) 14.5068
(d) 31.3653
(e) 11.2018

9. Using the secant method, find p_3 for $f(x) = x^2 - 6$ with initial guesses $p_0 = 3$ and $p_1 = 2$.

   (a) $p_3 = 2.45454$
   (b) $p_3 = 2.35344$
   (c) $p_3 = 2.3$
   (d) $p_3 = 2.55456$
   (e) $p_3 = 2.4$

10. Using the fixed-point iteration $x_{n+1} = g(x_n)$ to compute $\alpha = \sqrt[3]{21}$, which of the following functions does **not** converge to α for any initial guess $x_0 \in [2, 3]$? Assume each g is well-defined and differentiable on $[2, 3]$.

    (a) $g(x) = \dfrac{20}{21}x + \dfrac{1}{x^2}$
    (b) $g(x) = \dfrac{\sqrt{21}}{x^{1/2}}$
    (c) $g(x) = \dfrac{x^3 - x^4}{x^2 - 21}$
    (d) $g(x) = x - \dfrac{x^3 - 21}{30}$
    (e) $g(x) = x - \dfrac{x^3 - 21}{3x^2}$

11. Let $f(0.5) = 0.4794$, $f(0.6) = 0.5646$, $f(0.7) = 0.6442$. Using the most accurate 3−point formulas, the sum $f'(0.5) + f'(0.6)$ is equal to

(a) 0.8420
(b) 1.6480
(c) 0.8800
(d) 1.7040
(e) 0.7860

12. The bound of number of iterations using bisection method needed to achieve an approximation with accuracy 10^{-3} to the solution of $x^3 + x - 4 = 0$ lying in the interval $[1, 4]$ is

(a) $n \geq 15$
(b) $n \geq 10$
(c) $n \geq 12$
(d) $n \geq 3$
(e) $n \geq 5$

13. Let

$$f(x) = \frac{e^x - e^{-x}}{x}$$

Use three-digit rounding arithmetic to compute $f(0.1)$

(a) 2.15
(b) 2.25
(c) 2.05
(d) 2.03
(e) 2.003

14. The bisection method converges to which of the zero of $f(x) = (x+2)(x+1)x(x-1)^3(x-2)$ in the interval $[-1.75, 1.5]$

(a) 1
(b) 2
(c) -2
(d) -1
(e) 0

Answer KEY

Q	MASTER	CODE01	CODE02	CODE03	CODE04
1	A	C 9	A 4	B 3	D 1
2	A	A 11	E 3	D 2	B 13
3	A	B 2	B 12	C 9	A 14
4	A	D 12	D 7	D 6	C 6
5	A	C 13	D 5	D 10	D 8
6	A	D 14	A 8	C 8	C 11
7	A	D 6	C 10	D 14	A 9
8	A	B 4	B 14	A 7	D 12
9	A	E 5	E 9	C 11	A 7
10	A	C 1	E 2	A 4	C 5
11	A	C 7	B 13	B 5	D 10
12	A	D 10	B 1	B 12	C 3
13	A	B 3	B 11	E 1	C 2
14	A	C 8	C 6	C 13	D 4

Answer Counts

V	A	B	C	D	E
1	1	3	5	4	1
2	2	5	2	2	3
3	2	3	4	4	1
4	3	1	5	5	0