

King Fahd University of Petroleum and Minerals
Department of Mathematics
Math 101
Exam II
223
July 31, 2023
Net Time Allowed: 120 Minutes

MASTER VERSION

Question 25/ Section 4.2

1. The value of c which satisfies the conclusion of Rolle's theorem for the function $f(x) = (x^2 - 2x)e^x$ on $[0, 2]$ is

- (a) $\sqrt{2}$ _____(correct)
- (b) $-\sqrt{2}$
- (c) 1
- (d) $\frac{\sqrt{2}}{2}$
- (e) $\frac{1}{2}$

Question 29/ Section 4.1

2. Let $f(x) = x^3 - \frac{3}{2}x^2$ on $[-1, 2]$ and let M be the absolute maximum of $f(x)$ and m be the absolute minimum of $f(x)$. Then $M + m =$

- (a) $\frac{-1}{2}$ _____(correct)
- (b) $\frac{-5}{2}$
- (c) 1
- (d) $\frac{-3}{4}$
- (e) $\frac{3}{2}$

Question 9/ Section 3.8

3. By using Newton's method to approximate a zero of the function $f(x) = x^3 + x - 1$ using the initial guess $x_1 = \frac{1}{2}$, we get $x_2 =$

- (a) $\frac{5}{7}$ _____(correct)
- (b) $\frac{6}{7}$
- (c) 1
- (d) $\frac{4}{7}$
- (e) $\frac{3}{7}$

Question 138/ section 3.4

4. If $f(t) = \frac{3^{2t}}{t}$, then $f'(1) =$

- (a) $18 \ln 3 - 9$ _____(correct)
- (b) $9 \ln 3 - 2$
- (c) $18 \ln 3 + 4$
- (d) $9 \ln 3 - 1$
- (e) $18 \ln 3$

Question 61/ Section 4.3

5. The sum of all values of a in the interval $(0, 2\pi)$ for which the function $f(x) = \cos^2(2x)$ has a relative extremum at $x = a$ is

- (a) 7π _____(correct)
(b) 6π
(c) 5π
(d) 4π
(e) 8π

Question 10/ section 4.3

6. The function $f(x) = \frac{x^2}{2x - 1}$ is decreasing on the interval

- (a) $\left(0, \frac{1}{2}\right)$ _____(correct)
(b) $(-\infty, 0)$
(c) $(1, \infty)$
(d) $\left(-1, \frac{1}{2}\right)$
(e) $\left(\frac{1}{2}, 2\right)$

Question 54/ Section 4.2

7. The value of c which satisfies the conclusion of the Mean Value Theorem for the function $f(x) = (x + 3) \ln(x + 3)$ on $[-2, -1]$ is

(a) $\frac{4 - 3e}{e}$ _____(correct)

(b) $\frac{2 - 3e}{e}$

(c) $\frac{3 - 3e}{e}$

(d) $4 - 3e$

(e) $3 - 3e$

Question 17/ Section 4.1

8. The sum of all critical numbers of the function $f(t) = t\sqrt{4-t}$ in the interval $(-\infty, 3)$ is

(a) $\frac{8}{3}$ _____(correct)

(b) $\frac{7}{3}$

(c) 3

(d) 2

(e) $\frac{10}{3}$

Question 108/ Review Chapter 3

9. If $y = \frac{(2x + 1)^3(x^2 - 1)^2}{x + 3}$, then $y'(0) =$

- (a) $\frac{17}{9}$ _____(correct)
(b) 2
(c) $\frac{19}{9}$
(d) $\frac{16}{9}$
(e) $\frac{5}{3}$

Question 15/ Section 3.7

10. All edges of a cube are expanding at a rate of 6 centimeters per second (cm/s). How fast (in cm^3/s) is the volume changing when each edge is 2 cm ?

- (a) 72 _____(correct)
(b) 36
(c) 144
(d) 108
(e) 60

Question 62/ section 3.6

11. The slope of the graph of the equation $\arcsin(xy) = \frac{2}{3} \arctan(2x)$ at the point $\left(\frac{1}{2}, 1\right)$ is

(a) $\frac{2\sqrt{3} - 6}{3}$ _____(correct)

(b) $\frac{2\sqrt{3} + 4}{3}$

(c) $\frac{\sqrt{3} - 4}{2}$

(d) $\frac{2\sqrt{3} + 5}{3}$

(e) $\frac{2\sqrt{3} - 6}{5}$

Question 3/ Section 3.6

12. If $f(x) = 5 - 2x^3$ has an inverse function, then $(f^{-1})'(7) =$

(a) $\frac{-1}{6}$ _____(correct)

(b) $\frac{1}{6}$

(c) $\frac{-1}{5}$

(d) $\frac{1}{5}$

(e) $\frac{1}{3}$

Question 68/ section 3.5

13. The number of points at which the graph of the equation $4x^2 + y^2 - 8x + 4y + 4 = 0$ has a vertical tangent line is

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

Example 7/ Section 3.5

14. If $x^2 + y^2 = 25$, then $\frac{d^2y}{dx^2} =$

- (a) $\frac{-25}{y^3}$ _____(correct)
- (b) $\frac{25}{y^3}$
- (c) $\frac{-5}{y^3}$
- (d) $\frac{5}{y^3}$
- (e) $\frac{-25}{y^2}$

Question 30/ Section 3.4

15. If $g(x) = \left(\frac{3x^2 - 2}{2x + 3}\right)^{-2}$, then $g'(0) =$

- (a) 3 _____(correct)
(b) 4
(c) 2
(d) 1
(e) 5

Question 103/ Section 4.3

16. If the function $f(x) = a_3x^3 + a_2x^2 + a_1x + a_0$ has a relative minimum at $(0, 0)$ and a relative maximum at $(2, 2)$, then $a_3 + a_2 + a_1 + a_0 =$

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

Question 21-b/ Section 3.7

17. A ladder 10 meters long is leaning against the wall of a house. The base of the ladder is pulled away from the wall at a rate of $\frac{2}{3}$ meters per second (m/s). Consider the triangle formed by the side of the house, the ladder, and the ground. The rate (in m^2/s) at which the area of the triangle is changing when the base of the ladder is 6 meters from the wall is

- (a) $\frac{7}{6}$ _____(correct)
- (b) $\frac{5}{6}$
- (c) $\frac{3}{2}$
- (d) $\frac{5}{2}$
- (e) 1

Question 5 (b)/ Problem Solving Chapter 3

18. The normal line to the parabola $y = x^2$ at the point $(2, 4)$ intersects the parabola a second time at

- (a) $\left(\frac{-9}{4}, \frac{81}{16}\right)$ _____(correct)
- (b) $(4, 16)$
- (c) $(-1, 1)$
- (d) $\left(\frac{-2}{3}, \frac{4}{9}\right)$
- (e) $\left(\frac{-7}{4}, \frac{49}{16}\right)$

Q	MASTER	CODE01	CODE02	CODE03	CODE04
1	A	E ₃	B ₂	C ₄	D ₃
2	A	D ₂	D ₃	E ₂	A ₄
3	A	B ₁	E ₁	D ₃	C ₂
4	A	E ₄	C ₄	E ₁	E ₁
5	A	D ₁₁	A ₁₃	A ₅	B ₁₁
6	A	D ₁₃	A ₁₅	A ₁₄	A ₉
7	A	A ₁₀	D ₈	E ₁₅	B ₁₃
8	A	D ₈	E ₁₄	D ₉	D ₆
9	A	A ₅	A ₉	E ₁₀	E ₇
10	A	B ₉	A ₁₂	A ₁₃	B ₅
11	A	C ₁₄	C ₇	B ₆	D ₁₂
12	A	E ₁₅	B ₅	C ₈	E ₁₅
13	A	E ₇	B ₁₁	D ₇	D ₈
14	A	D ₆	E ₁₀	A ₁₁	E ₁₄
15	A	B ₁₂	C ₆	A ₁₂	E ₁₀
16	A	B ₁₈	E ₁₈	D ₁₇	C ₁₆
17	A	C ₁₇	D ₁₇	B ₁₆	C ₁₈
18	A	E ₁₆	E ₁₆	B ₁₈	B ₁₇