King Fahd University of Petroleum and Minerals
Department of Mathematics
Math 106
Major Exam II
212
March 27, 2022
Net Time Allowed: 90 Minutes

MASTER VERSION

1. If $f(x) = (2x^2 + 1)^{x^2-1}$, then $f'(1) =$

(a) $2 \ln 3$ (correct)
(b) $3 \ln 3$
(c) $\ln 3$
(d) 1
(e) 0

2. If $f(x) = 5 + \ln x^4$, then $f^{(5)}(-1) =$

(a) -96 (correct)
(b) 96
(c) 24
(d) -24
(e) 48

3. The function $f(x) = (x^2 - 4x + 3)^2$ has a relative maximum at $x =$

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

4. Let M be the absolute maximum value and m be the absolute minimum value for $f(x) = 16 - 3x - \dfrac{12}{x}$ on $[1, 6]$. Then $M + 2m =$

(a) -4 (correct)
(b) 7
(c) 6
(d) -7
(e) 0

5. If $f(x) = x - \dfrac{1}{x-1}$, $f'(x) = \dfrac{(x-1)^2+1}{(x-1)^2}$, and $f''(x) = -\dfrac{2}{(x-1)^3}$, which statement is False about the function f:

(a) it has one inflection point. (correct)

(b) it is concave up on $(-\infty, 1)$.

(c) it is concave down on $(1, \infty)$

(d) it is increasing on $(-\infty, 1) \cup (1, \infty)$

(e) it has no critical numbers.

6. Suppose $f''(x) = 4x(x-5)(x+5)$ and f has critical values $1, -1, 7, -7$. Then f has

(a) a relative minimum at -1 and 7 and a relative maximum at 1 and -7 (correct)

(b) a relative minimum at 1 and 7 and a relative maximum at -1 and -7

(c) a relative minimum at -1 and -7 and a relative maximum at 1 and 7

(d) a relative minimum at 1 and -7 and a relative maximum at -1 and 7

(e) no relative extrema

7. If the graph of the function $f(x) = \dfrac{3x^2 - 5x - 1}{x - 2}$ has oblique asymptote with equation $y = mx + b$, then $m + b =$

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

8. The total cost c of producing q units of a product is $c = \dfrac{q^2}{500} + 30q + 2000$. The minimum average cost is

(a) 34 (correct)
(b) 30
(c) 38
(d) 42
(e) 46

9. Using differentials, we find that an approximation of $\sqrt{35.4}$ is

(a) 5.95 (correct)
(b) 5.94
(c) 5.93
(d) 5.96
(e) 5.97

10. If $y'' = 6x - 8$, $y'(1) = 1$, $y(1) = 10$, then $y(-1) =$

(a) -4 (correct)
(b) 3
(c) 4
(d) -3
(e) -10

11. If $y' = 4(x+1)e^{x^2+2x}$ and $y(0) = 10$, then $y(-2) =$

(a) 10 (correct)
(b) 12
(c) -10
(d) -12
(e) 8

12. $\displaystyle\int \frac{x^3 + \sqrt{x} - 1}{x}\, dx =$

(a) $\dfrac{x^3}{3} + 2\sqrt{x} - \ln x + C$ (correct)
(b) $\dfrac{x^3}{3} + \dfrac{1}{2\sqrt{x}} - \ln x + C$
(c) $\dfrac{x^3}{3} + 2\sqrt{x} - \dfrac{1}{x^2} + C$
(d) $\dfrac{x^2}{2} + 2\sqrt{x} - \ln x + C$
(e) $\dfrac{x^3}{3} + \dfrac{1}{2\sqrt{x}} - \dfrac{1}{x^2} + C$

13. The monthly fixed cost of a certain product is \$2000 and the marginal cost of producing q units is $\frac{dc}{dq} = 2q + 75$. The cost of producing 10 units a month is:

(a) 2850 (correct)
(b) 2075
(c) 850
(d) 2077
(e) 2000

14. The demand equation of a certain product is

$$p = \frac{80 - q}{4}, 0 \leq q \leq 80$$

where q is the number of units and p is price unit. If A is the maximum revenue when the price per units is B, then $A + B =$

(a) 410 (correct)
(b) 80
(c) 800
(d) 40
(e) 10

15. The function $f(x) = x^4 - 2x^2$ has relative minimum only at

(a) $x = -1$ and $x = 1$ (correct)

(b) $x = 0$

(c) $x = 0$ and $x = 1$

(d) $x = -1$ and $x = 0$

(e) $x = 1$ and $x = 2$