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) $2 \ln 3$
- (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
 - (b) 96
 - (c) 24
 - (d) -24
 - (e) 48

(correct)

- 3. The function $f(x) = (x^2 4x + 3)^2$ has a relative maximum at x =
 - (a) 2
 - (b) 0
 - (c) 1
 - (d) 3
 - (e) 4

- 4. Let *M* be the absolute maximum value and *m* be the absolute minimum value for $f(x) = 16 3x \frac{12}{x}$ on [1, 6]. Then M + 2m =
 - (a) -4 (correct) (b) 7 (c) 6 (d) -7(e) 0

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

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

(correct)

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(correct)

(correct)

- 7. If the graph of the function $f(x) = \frac{3x^2 5x 1}{x 2}$ has oblique asymptote with equation y = mx + b, then m + b =
 - (a) 4
 - (b) 3
 - (c) 2
 - (d) 1
 - (e) 5

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

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

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(correct)

- 9. Using differentials, we find that an approximation of $\sqrt{35.4}$ is
 - (a) 5.95
 - (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) = 10

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

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

(a)
$$\frac{x^3}{3} + 2\sqrt{x} - \ln x + C$$

(b) $\frac{x^3}{3} + \frac{1}{2\sqrt{x}} - \ln x + C$
(c) $\frac{x^3}{3} + 2\sqrt{x} - \frac{1}{x^2} + C$

(d)
$$\frac{x^2}{2} + 2\sqrt{x} - \ln x + C$$

(e)
$$\frac{x^3}{3} + \frac{1}{2\sqrt{x}} - \frac{1}{x^2} + C$$

(correct)

- 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
 - (b) 2075
 - (c) 850
 - (d) 2077
 - (e) 2000

14. The demand equation of a certain product is

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

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)
$$x = -1 \text{ and } x = 1$$

- (b) x = 0
- (c) x = 0 and x = 1
- (d) x = -1 and x = 0
- (e) x = 1 and x = 2