

King Fahd University of Petroleum and Minerals
Department of Mathematics

Math 106
Major Exam I
231
October 04, 2023

EXAM COVER

Number of versions: 4
Number of questions: 20



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Net Time Allowed: 120 Minutes

MASTER VERSION

1. The value of $\lim_{x \rightarrow -6} \frac{x^2 + 6}{x - 6}$ is

10.1 Q16

- (a) $-\frac{7}{2}$ _____(correct)
(b) 6
(c) does not exist
(d) 0
(e) $-\infty$

2. The value of $\lim_{x \rightarrow 2^+} \left(2 + \frac{1}{x - 2}\right)$ is

10.2 Q41

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

3. The value of $\lim_{x \rightarrow 2} \frac{x^2 - x - 2}{x - 2}$ is

10.1 Q23

- (a) 3 _____(correct)
(b) -2
(c) ∞
(d) $-\infty$
(e) -1

4. If $y = \sqrt[3]{(4x^2 + 3x - 2)^2}$, then $\frac{dy}{dx}$ when $x = -2$

11.5 Example 4

- (a) $-\frac{13}{3}$ _____(correct)
(b) $-\frac{3}{4}$
(c) $-\frac{11}{5}$
(d) 1
(e) -2

5. The points of discontinuity of

10.3 Q23

$$f(x) = \frac{x^2 + 6x + 9}{x^2 + 2x - 15}$$

are

- (a) $x = -5$ and $x = 3$ _____(correct)
(b) $x = -5$ and $x = -3$
(c) $x = 6$ and $x = 9$
(d) $x = -15$ and $x = 2$
(e) $x = 5$ and $x = 2$

6. The number of points of discontinuity of the function

10.3 Q34

$$f(x) = \begin{cases} \frac{16}{x^2} & x \geq 2 \\ 3x - 2 & x < 2 \end{cases}$$

10.3 Q34

is

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

7. An equation of the tangent line to the curve $y = x^2 + 3x + 2$ at the point $(1, 6)$ is

11.1 Q12

(a) $y - 5x - 1 = 0$ _____(correct)

(b) $y + 5x + 1 = 0$

(c) $y - 5x + 22 = 0$

(d) $y + 5x - 12 = 0$

(e) $y - 4x + 3 = 0$

8. The equation of tangent line to the curve $y = -\sqrt[3]{x}$ at the point $(8, -2)$ is

11.2 Q82

(a) $x + 12y + 16 = 0$ _____(correct)

(b) $x + 8y - 2 = 0$

(c) $y = \frac{1}{4}x - \frac{3}{4}$

(d) $y = \frac{1}{2}x - 1$

(e) $y = -\frac{1}{4}x + 1$

9. If the position function of an object moving along a number line is given by $s = f(t) = 2e^t + 3$, where t is in seconds and s is in meters, then the average velocity over the interval $[0, 1]$ equals

11.3 Q4

- (a) $2(e - 1)$ _____(correct)
(b) 0
(c) 1
(d) 3
(e) $5(2e + 3)$

10. If a manufacturer's cost equation is $c = 0.2q^2 + 4q + 50$ where c is the cost of producing q units of a product. Find the marginal-cost when 10 units are produced.

11.3 Q15

- (a) 8 _____(correct)
(b) 4
(c) 50
(d) 0.2
(e) 0.4

11. If $y = (x - 1)(x - 2)(x - 3)$, then $\frac{dy}{dx}$ is 11.4 Q18

- (a) $3x^2 - 12x + 11$ _____(correct)
(b) $3x^2 - 10x + 17$
(c) $3x^2 - 3x + 2$
(d) $3x^2 - 2x + 3$
(e) $3x^2 - 12x + 15$

12. If the demand equation for a manufacturer's product is $p = 80 - 0.02q$ where p is in dollars, then the marginal-revenue function is

11.4 Q59

- (a) $80 - 0.04q$ _____(correct)
(b) $80q$
(c) -0.04
(d) $-0.08q$
(e) 1

13. If $y = 3w^2 - 8w + 4$ and $w = 2x^2 + 1$, then dy/dx when $x = 1$.

11.5 Q7

- (a) 40 _____(correct)
(b) -8
(c) 30
(d) -80
(e) -10

14. If $f(z) = \frac{\ln z}{z}$, then $f'(z) =$

12.1 Q19

- (a) $z^{-2}(1 - \ln z)$ _____(correct)
(b) $\frac{1 + \ln z}{z^4}$
(c) $z^{-4}(1 + \ln z)$
(d) $\frac{1}{z}$
(e) z^3

15. The equation of the tangent line to the curve $y = \ln(x^2 - 3x - 3)$ at the point where $x = 4$ is

12.1 Q45

(a) $y = 5x - 20$ _____(correct)

(b) $y = -3x - 3$

(c) $y = 4x - e$

(d) $y = 5x + e$

(e) $y = e$

16. The slope of the tangent line to the curve of $y = e^{x-\sqrt{x}}$ at $x = 1$ is

12.2 Q18

(a) $\frac{1}{2}$ _____(correct)

(b) $-e^{-\frac{1}{2}}$

(c) $e^{\frac{1}{2}}$

(d) 1

(e) $\frac{1}{4}$

17. Let $f(x) = e^{2x}(x + 6)$ then $f'(0)$ is

12.2 Q17

- (a) 13 _____(correct)
(b) 11
(c) 15
(d) 17
(e) 6

18. If $y + y^3 - x = 7$, then $\frac{dy}{dx}$ by implicit differentiation is equal to

12.4 Example 1

- (a) $\frac{1}{1 + 3y^2}$ _____(correct)
(b) $\frac{1}{1 - xy}$
(c) $\frac{y^3}{x + 7}$
(d) $\frac{x}{y + 1}$
(e) $\frac{y}{xy + 1}$

19. If $q + p = \ln q + \ln p$, find $\frac{dq}{dp}$, (assume that q is a function of p)

12.4 Example 4

- (a) $\frac{(1-p)q}{p(q-1)}$ _____(correct)
- (b) $\frac{(1+p)}{(q-1)}$
- (c) $\frac{(1-p)}{p(q-1)}$
- (d) $\frac{(1+p)q}{p(q+1)}$
- (e) $\frac{(1-p)q}{p(q+1)}$

20. If $y = (4x - 3)^{2x+1}$, find dy/dx when $x = 1$

12.5 Q21

- (a) 12 _____(correct)
- (b) 4
- (c) -3
- (d) 2
- (e) 14