King Fahd University of Petroleum and Minerals
Department of Mathematics

**Math 106**

**Exam II**

**231**

**November 06, 2023**

**Net Time Allowed: 120 Minutes**

# USE THIS AS A TEMPLATE

**Write your questions, once you are satisfied upload this file.**

1. Find the slope of the curve $y^2 + xy - x^2 = 5$ at the point $(4, 3)$

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

30/Sec(12.4)

2. The slope of the tangent line to $y = (3x + 4)(8x - 1)^2(3x^2 + 1)^4$ at $x = 0$ is equal to

(a) -61
(b) -43
(c) 16
(d) 75
(e) 24

2/Sec(12.5)

3. If $x^2 + 2xy + y = 1$, then $\dfrac{d^2y}{dx^2}$ when $x = 0$ and $y = 0$ is

(a) -2
(b) 2
(c) 5
(d) -1
(e) -5

30/Sec(12.7)

4. At $x = -2$ the function $f(x) = -3 + 12x - x^3$ has

(a) a relative minimum
(b) a relative maximum
(c) an absolute maximum
(d) an absolute minimum
(e) neither maximum nor minimum

16/Sec(13.1)

5. The absolute maximum of $f(x) = -3x^5 + 5x^3$ over the interval $[-2, 0]$ is equal to

(a) 56
(b) -3
(c) 5
(d) 96
(e) -40

7/Sec(13.2)

6. The function $f(x) = \dfrac{x}{x^2+4}$ over the interval $[0, 4]$ has the

(a) absolute maximum at $x = 2$
(b) absolute minimum at $x = 4$
(c) absolute maximum at $x = 0$
(d) absolute minimum at $x = -2$
(e) absolute minimum at $x = 2$

12/Sec(13.2)

7. The curve of the function $f(x) = \dfrac{x^5}{100} - \dfrac{x^4}{20}$ concave up on the interval

(a) $(3, 5)$
(b) $(0, 3)$
(c) $(-3, 3)$
(d) $(-3, 0)$
(e) $(1, 4)$

50/Sec(13.3)

8. The number of inflection points of the function $f(x) = 6x^4 - 8x^3 + 1$ is equal to

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

Example2/Sec(13.3)

9. The number of relative minimum of the function $f(x) = x^4 - 2x^2 + 4$ is equal to

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

8/Sec(13.4)

10. At $x = \frac{1}{4}$ the function $y = -4x^2 + 2x - 8$ has

(a) an absolute maximum
(b) a relative minimum
(c) a relative maximum
(d) an absolute minimum
(e) an inflection point

3/Sec(13.4)

11. The function $f(x) = \dfrac{2x^3+1}{3x(2x-1)(4x-3)}$ has

14/Sec(13.5)

(a) one horizontal asymptote
(b) two vertical asymptote
(c) one vertical and two horizontal asymptote
(d) no asymptotes
(e) one horizontal and one oblique asymptote

12. The slope of the oblique asymptote of

$$f(x) = \frac{10x^2+9x+5}{5x+2}$$

is equal to

Example3/Sec(13.5)

(a) 2
(b) 5
(c) $-2$
(d) 10
(e) $-\dfrac{9}{5}$

13. Suppose that the demand equation for a monopolist's is $p = 444 - 2q$ and the average-cost function is $\bar{c} = 0.2q + 4 + (444/q)$, where $q$ is number of units, and both $p$ and $\bar{c}$ are expressed in dollars per unit. The maximum profit occur when $q =$

    (a) \$100
    (b) \$444
    (c) \$94
    (d) \$86
    (e) \$44

Similar to Example8/Sec(13.6)

14. The demand equation for a manufacturer's product is $p = \dfrac{100 - q}{4} \qquad 0 \le q \le 100$ where $q$ is the number of units and $p$ is the price per unit. The absolute maximum revenue is equal to

    (a) 625
    (b) 100
    (c) 500
    (d) 540
    (e) 675

15. Let $q(p) = e^{4-2p}$, then by using differentials $q(2.1) \approx$

(a) 0.8
(b) 1.1
(c) 0.9
(d) 0.6
(e) 1.2

32/Sec(14.1)

16.

$$\int \left( \frac{x^3}{3} - \frac{3}{x^3} \right) \, dx \ =$$

(a) $\frac{x^4}{12} + \frac{3}{2x^2} + C$
(b) $\frac{x^4}{3} - \frac{3}{x^4} + C$
(c) $\frac{x^4}{12} + \frac{3}{4x^4} + C$
(d) $\frac{x^4}{4} + \frac{2}{x^2} + C$
(e) $\frac{x^4}{4} - \frac{4}{x^4} + C$

29/Sec(14.2)

17.

$$\int \frac{3x^4 - 5x^2 + 5x}{5x^2}\, dx =$$

(a) $\frac{x^3}{5} - x + \ln|x| + C$

(b) $\frac{x^3}{3} + \frac{2}{5}\ln|x| + C$

(c) $\frac{x^3}{5} - 5x + 2\ln|x| + C$

(d) $\frac{x^3}{5} - 5x + \ln|x| + C$

(e) $2x^2 - x + \frac{2}{5}\ln|x+1| + C$

Similar to 50/Sec(14.2)

18. The marginal revenue of a product is

$$\frac{dr}{dq} = 2000 - 20q - 3q^2.$$

Then the unit price when producing 20 units $p(20) =$

(a) 1400

(b) 1600

(c) 2000

(d) 500

(e) 1800

Example4/Sec(14.3)

19. If $y'' = -3x^2 + 4x$ , $y(1) = \frac{2}{3}$, and $y'(1) = 2$ then $y(0) =$

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

5/Sec(14.3)

20. If $\ln(xy) + x = 4$, then $\frac{dy}{dx}$ when $x = 4$, and $y = \frac{1}{4}$ is equal to

(a) $-\frac{5}{16}$
(b) 4
(c) $-\frac{1}{4}$
(d) $-\frac{5}{9}$
(e) $\ln 4$

20/Sec(12.4)