



REMEDIAL STUDENT



**REMEDIAL COURSE
INFO CENTER!**

Chapter- 4

1. If a line with angle of inclination of $\frac{3}{4}\pi$ passes through (0,1), which one of the following is the equation of the line?
A. $y = -x + 1$ B. $y = x + 1$ C. $y = -x - 1$ D. $y = x - 1$
2. If $x^2 - 6x + y^2 + k = 0$ is equation of a circle with radius w , then what is the value of k ?
A. 13 B. 5 C. 4 D. -4
3. A parabola with focus at (3,-1) has directrix $y = 3$. Which one of the following is the equation of the parabola?
A. $(x-3)^2 = -4(y+1)$ C. $(x-3)^2 = 4(y+1)$
B. $(x-3)^2 = -8(y-1)$ D. $(x-3)^2 = 8(y-1)$

4. For what value of b does the parabola $p(x) = ax^2 + x + b$ pass through the points (-1,5) and (2,-1)?
A. 9 B. 3 C. -3 D. -15

5. What is the equation of the directrix for the parabola whose equation is $y^2 + 8x + 6y + 25 = 0$?
A. $y = 3$ B. $x = 2$ C. $x = 0$ D. $x = 4$

6. A semi-elliptical arch over a tunnel for a road through a mountain has a major axis of length 80 meters and a height of 30 meters at the center. What is the equation of the semi-elliptical arch over the tunnel, if the center is considered as the origin?

A. $\frac{x^2}{6400} + \frac{y^2}{900} = 1$ C. $\frac{x^2}{900} + \frac{y^2}{6400} = 1$
B. $\frac{x^2}{1600} + \frac{y^2}{900} = 1$ D. $\frac{x^2}{8100} + \frac{y^2}{6400} = 1$

7. If the equation $(x-2)^2 - (y-2)^2 = 1$ represents a hyperbola, which one of the following represents equation of an asymptote to the hyperbola?
A. $x = 4 - y$ B. $x + y = 1$ C. $x = 2 - y$ D. $x + 2y = 3$

13. A box contains 10 items of which 3 are defective. If 2 items are selected at random, what is the probability that both items are not defective?

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8. Two perpendicular lines ℓ_1 and ℓ_2 are intersecting at $(-1, 2)$. If the angle of inclination of ℓ_1 is 45° , then what is the equation of ℓ_2 ?
- A. $y = -x + 3$ B. $y = x + 3$ C. $y = -x + 1$ D. $y = x + 1$

9. Which one of the following is equation of a circle whose center is on y-axis and radius is 3?
- A. $x^2 + y^2 + 6y = 0$ C. $x^2 + (y - 2)^2 = 3$
 B. $(x - 2)^2 + y^2 = 9$ D. $x^2 - 2x + y^2 = 8$

10. Which one of the following is true about a conic section represented by the equation $\frac{x^2}{k} + \frac{y^2}{k-9} = 1$?
- A. It is a circle whose center is at origin for some $k \in \mathbb{R}$.
 B. It is an ellipse whose major axis is vertical when $k > 9$.
 C. It is a hyperbola whose foci are at $(-3, 0)$ and $(3, 0)$ when $0 < k < 9$.
 D. It is a hyperbola whose foci are at $(-3k, 0)$ and $(3k, 0)$ when $0 < k < 9$.

Chapter- 5

1. The following is a table of simple frequency distribution of a data with variable x .

x	1	3	4	5	7
Frequency	2	5	6	5	2

The standard deviation of the data is equal to:

- A. $\sqrt{3}$ B. 3 C. $\sqrt{2.3}$ D. $\sqrt{3.6}$

2. A student needs to select 3 books from 3 different mathematics, 3 different physics and 1 history book. What is the probability that one of them is mathematics and the other two are either physics or history books?

- A. $\frac{3}{35}$ B. $\frac{9}{35}$ C. $\frac{15}{35}$ D. $\frac{18}{35}$

Which one of the following is equal to $\lim_{x \rightarrow \infty} \left(\frac{3x}{3x+2} \right)^{-3x}$?

A. e^2

B. e^{-1}

C. e^{-2}

D. e^3

8. Let $f(x) = \begin{cases} a \frac{\sin 2x}{x}, & \text{if } x < 0 \\ e^{2x} - 2, & \text{if } x \geq 0 \end{cases}$

If f is continuous at $x = 0$, then what is the value of a ?

A. $\frac{1}{2}$

B. 2

C. $-\frac{1}{2}$

D. -1

9. The left hand side limit, $\lim_{x \rightarrow 0^-} \frac{xe^x - |x|}{x}$ is equal to _____

A. 0

B. 2

C. 1

D. Does not exist

10. Which one of the following is equal to $\lim_{x \rightarrow 0} \frac{2x + \tan x}{x \sec x}$?

A. 2

B. 0

C. 1

D. 3

11. In which interval the sequence $\left\{ \frac{(-1)^n}{3n} \right\}_{n=1}^{\infty}$ is bounded?

A. $\left[-\frac{1}{9}, \frac{1}{12} \right]$

B. $\left[-\frac{1}{3}, \frac{1}{6} \right]$

C. $\left[-\frac{1}{6}, \frac{1}{3} \right]$

D. $\left[-\frac{1}{12}, \frac{1}{9} \right]$

12. Which one of the following is true about the function

$$f(x) = \begin{cases} x^2, & x \neq 0 \\ 0^x, & x = 0 \end{cases}$$

A. f is continuous except at $x = 0$

B. f has an infinite discontinuity at $x = 0$

C. f is continuous every where

D. f has $x = 0$ as a vertical asymptote

13. $\lim_{x \rightarrow \infty} x \sin \frac{1}{x}$ is equal to:

A. 0

B. 1

C. ∞

D. -1

14. Which one of the following is equal to $\lim_{h \rightarrow 1} \frac{1-x}{1-\frac{1}{x}}$?

A. 1

B. 0

C. $-\frac{1}{2}$

D. Doesn't exist

11. A box contains 10 items of which 3 are defective. If 2 items are randomly taken out of the box, what is the probability that both items are not defective?

A. $\frac{7}{10}$

B. $\frac{4}{7}$

C. $\frac{7}{15}$

D. $\frac{49}{100}$

12. Two machines A and B work independently. The probability that both machines A and B work is 0.4. If the conditional probability that machine B works given that machine A works is 0.5, then the conditional probability that machine A works given that machine B works is _____.

A. 0.8

B. 0.3

C. 0.5

D. 0.7

Chapter- 6

1. To which of the following is $\lim_{n \rightarrow \infty} \frac{3\sqrt{n} - 6n + 5}{4n + 1}$?

A. $-\frac{3}{2}$

B. 0

C. $\frac{3}{4}$

D. $\frac{5}{4}$

2. To which of the following is $\lim_{x \rightarrow 1^+} \frac{x^4 - 1}{x - 1}$ equals to?

A. 4

B. 0

C. -

D. -4

3. Let $f(x) = \begin{cases} \frac{a}{x^2 + 3}, & \text{if } x \leq 1 \\ \frac{x-1}{\sqrt{x}-1}, & \text{if } x > 1 \end{cases}$

4. What is the value of a if f is continuous at $x = 1$?

A. 0

B. 2

C. 4

D. 8

5. $\lim_{x \rightarrow \infty} \left(1 + \frac{1}{x}\right)^{2x+4}$ is equal to:

A. e

B. e^2

C. e^4

D. ∞

6. Which one of the following is equal to $\lim_{h \rightarrow 1} \frac{1-x}{1-\frac{1}{x}}$?

A. 1

B. 0

C. $-\frac{1}{2}$

D. Doesn't exist

that students scored in an examination is grouped in class intervals as shown in the following table.

Class Interval (Mark)	Number of students
55-64	8
65-74	12
75-84	20
85-94	6
95-100	4

What is the median of the mark?

A. 25.0

B. 75.5

C. 77.0

D. 79.5

4. A committee consisting of 3 students is to be selected from 10 candidates among which 4 are girls. What is the probability that at least one girl is selected?

A. $\frac{5}{6}$

B. $\frac{2}{3}$

C. $\frac{1}{3}$

D. $\frac{1}{6}$

5. A box contains 5 white, 6 red and 4 black balls of identical size. If 3 balls are randomly taken out of the box one after the other, what is the probability that the first ball is white and both the second and third balls are red?

A. $\frac{2}{15}$

B. $\frac{3}{15}$

C. $\frac{4}{75}$

D. $\frac{5}{91}$

6. If the list of a measurement is 10, α , 5, α , 5, 10, 20, 15, 20, 5 with mean $\bar{x}$, then what is the value of α in terms of $\bar{x}$?

A. $10\bar{x} - 90$

B. $9\bar{x} - 90$

C. $5\bar{x} - 90$

D. $5\bar{x} - 45$

The following is the frequency distribution of a grouped data.

Class Intervals	Frequency (f)
3 - 7	2
8 - 12	2
13 - 17	10
18 - 22	6

7. What is the mean and standard deviation of the distribution, respectively?

A. 15, $2\sqrt{5}$

B. 15, $\sqrt{7.5}$

C. 12.5, $5\sqrt{2}$

D. 12.5, $\sqrt{15}$

8. A measurement is grouped into five class intervals with the following frequency distribution.

Class Interval	5 - 15	15 - 25	25 - 35	35 - 45	45 - 55
Frequency	22	40	68	50	20

What are the first quartile Q_1 and the 75th percentile P_{75} of the measurement?

A. $Q_1 = 20$, $P_{75} = 40$,

C. $Q_1 = 20$, $P_{75} = 39$

B. $Q_1 = 22$, $P_{75} = 40$

D. $Q_1 = 22$, $P_{75} = 39$

9. Three persons P_1 , P_2 and P_3 are firing at a target independently and have a probability 0.7, 0.5 and 0.4, respectively, of hitting the target. What is the probability that at least one of them hits the target?

A. 0.95

B. 0.85

C. 0.91

D. 0.99

10. The following is a simple frequency distribution of a data with variable X.

X	3	5	6	7
Frequency	2	5	2	1

What are the mean $\bar{x}$ and variance Q^2 of the data?

A. $\bar{x} = 5$, $Q^2 = 0.7$

C. $\bar{x} = 6$, $Q^2 = 0.7$

B. $\bar{x} = 6$, $Q^2 = 1.4$

D. $\bar{x} = 5$, $Q^2 = 1.4$

Chapter- 7

1. $\lim_{x \rightarrow 0} \frac{x \csc 3x}{x+1}$ is equal to:

A. $\frac{1}{3}$

B. 2

C. 1

D. 0

2. If $f(x) = \pi^2$, then $f'(1)$ is equal to

A. 2

B. 2

C. 1

D. ∞

3. Let $f(x) = \frac{ax}{x+a}$. For what value of a is $f(1) = 1$?

A. $\frac{1}{3}$

B. $\frac{2}{3}$

C. $\frac{3}{2}$

D. 3

4. Which one of the following is necessarily true about a function $f(x)$?

A. If f is continuous at $x \neq a$, then f is differentiable at $x = 1$.

B. If f is not differentiable at $x = a$, then $\lim_{x \rightarrow a^-} f(x) \neq \lim_{x \rightarrow a^+} f(x)$.

C. If f is differentiable at $x \neq a$, then $\lim_{x \rightarrow a^-} f(a) \neq \lim_{x \rightarrow a^+} f(x)$.

D. If the derivative $f'(a) = 0$, then f attains its maximum value at $x = a$.

5. If $f(x) = e^{2x} + x - 3 \cos(x)$, then what is $f'(x)$?

A. $e^{2x} + x - 3 \cos(x)$

C. $4e^{2x} - 3 \cos(x)$

B. $e^{2x} + x + 3 \cos(x)$

D. $4e^{2x} + 3 \cos(x)$

6. If $g(x) = xf(x) - \sqrt{f(x)}$ and $f(2) = f'(2) = 4$, then which of the following is equal to $g'(2)$?

A. 11

B. 8

C. 2

D. 0

7. Which one of the following is true about the derivative of $f(x) = x|x|$?

A. f is not differentiable at $x = 0$

B. $f'(x) = 2|x|$, for every $x \in (-\infty, \infty)$

C. $f'(x) = 2x$, for every $x \in (-\infty, \infty)$

D. $f'(x) = |x| + x$, for every $x \in (-\infty, \infty)$

8. Which one of the following is the equation of the line tangent to the graph of $f(x) = \frac{1}{x+1} + \cos x$ at $(0, f(0))$?

A. $x+y = 1$

B. $x-y = -2$

C. $x+y = 2$

D. $x+4y = 2$

7. If $f(x) = \frac{x^2}{1+xg(x)}$, $g(2) = 1$ and $g'(x) = 10$, then which one of the following is equal to $f'(2)$?

A. -8

B. $-\frac{8}{9}$

C. $\frac{4}{3}$

D. $\frac{8}{9}$

10. The simplified form of the derivative of $f(x) = \frac{1+x\sin x}{\cos x}$ is

A. $\sec x + \tan x$

C. $\frac{1}{1+\tan x}$

B. $\frac{1+\sin x}{\cos^2 x}$

D. $\frac{\cos x}{\sin^2 x}$

11. If $f(x) = e^{2x} \sin x$, then $f''(x)$ is equal to

A. $3e^{2x} \sin - 4e^{2x} \cos x$

C. $e^{2x}(3 \sin x + 4 \cos x)$

B. $3e^{2x} \sin x + 2e^{2x} \cos x$

D. $e^{2x}(4 \sin x - 3 \cos x)$

12. If $f(x) = \ln(\sqrt{x^2+1})$, which of the following is equal to $f'(x)$?

A. $\frac{x}{\sqrt{x^2+3}}$

B. $\frac{x}{x^2+1}$

C. $\frac{2x}{\sqrt{x^2+1}}$

D. $\frac{2x}{x^2+1}$

13. If $y = \sin(3x^2)$, then the simplified form of $\frac{d^2y}{dx^2}$ is:

A. $-6 \sin(3x^2)$

C. $6 \cos(3x^2) - 36x^2 \sin(3x^2)$

B. $\cos(6x) - 6 \sin(3x^2)$

D. $x^2 \cos(3x^2) + 6 \sin(3x^2)$

14. If $f(x) = x^2 \sqrt{2x+12}$, what is the slope of the tangent line to the graph of f at $x=2$?

A. -4

B. 2

C. 18

D. 17

15. If $F(x) = f(2x+2) \cdot g(1-x^2)$, with $f(2) = -3$, $f'(2) = 4$, $g(1) = -5$, and $g'(1) = 1$, then what is the actual value of $F'(0)$?

A. -40

B. -20

C. 0

D. 19

$f(x) = 2x(x^2 + 1)^4$, then which of the following is an anti derivative of $f(x)$?

A. $\frac{2x}{5}(x^2 + 1)^5 + c$

B. $\frac{2}{5}(x^2 + 1)^5 + c$

C. $\frac{x}{5}(x^2 + 1)^5 + 1$

D. $\frac{1}{5}(x^2 + 1)^5 - 1$

17. The Ozone level (in ppb - parts per billion) on a sunny day in a metropolitan area is given by the formula: $p(t) = 80 + 12t - t^2$, where t is time in hours and $t = 0$ corresponds to 9 A.M. what is the rate of increase of the ozone level after 3 hours (i.e. at 12 A.M.)?

A. 6 ppb
ppb

B. 12 ppb

C. 107 ppb

D. 113

18. Suppose that a function f has the property that $f(x + y) = f(x)f(y)$ for all value of x and y and that $f(0) = 2$, $f'(0) = 1$. Then which one of the following represents the formula for the derivative $f'(x)$?

A. $f'(x) = 2f'(x) + 1$

B. $f'(x) = f(x) + 2f'(x)$

C. $f'(x) = f(x) + 2$

D. $f'(x) = 2f(x) - 1$

19. if $f(2) = -3$, $f'(2) = 4$, $g(1) = -5$, $g'(1) = 1$ and $f(x) = f(2x + 2)$, $g(1 - x^2)$, then what is the value of $F'(0)$?

A. 19

B. 0

C. -20

D. -40

20. For what values of a and b is the function

$f(x) = \begin{cases} 1 - 3x^2, & \text{for } x \leq 1 \\ ax + b, & \text{for } x > 1 \end{cases}$

differentiable at $x = 1$?

A. $a = 6, b = 0$

B. $a = -3, b = 1$

C. $a = 0, b = -2$

D. $a = -6, b =$

21. If $f(x) = 2x^5 - 3x$, then $\lim_{x \rightarrow 1} \frac{f(x) - f(1)}{x - 1}$ is equal to _____.

A. 1

B. -1

C. 7

D. ∞

22. If $f(x) = e^{3x} \cos x - \frac{x + \pi}{x^2 + 2}$, then $f'(0)$ is equal to _____.

A. $3 - \frac{\pi}{2}$

B. $\frac{3}{2}$

C. $\frac{7}{4}$

D. $\frac{5}{2}$

23. If $f(x) = \ln(\sqrt{x^2 - 5})$, which one of the following is equal to $f'(x)$?

A. $\frac{x}{x^2 - 5}$

B. $\frac{-x}{\sqrt{x^2 - 5}}$

C. $\frac{2x}{\sqrt{x^2 - 5}}$

D. $\frac{-x}{x^2 - 5}$

24. $\frac{d}{dx}(Ine^{2x})$ is equal to:

A. $\frac{1}{e^{2x}}$

B. $\frac{2}{e^{2x}}$

C. $2x$

D. 2

25. If $f(x) = 2 + |x - 3|$ for all x , then the value of the derivative $f'(x)$ at $x = 3$ is _____.

A. -1

B. does not exist

C. 1

D. 2

$f(x) = 2x(x^2 + 1)^4$, then which of the following is an anti derivative of $f(x)$?

A. $\frac{2x}{5}(x^2 + 1)^5 + c$

B. $\frac{2}{5}(x^2 + 1)^5 + c$

C. $\frac{x}{5}(x^2 + 1)^5 + 1$

D. $\frac{1}{5}(x^2 + 1)^5 - 1$

17. The Ozone level (in ppb - parts per billion) on a sunny day in a metropolitan area is given by the formula: $p(t) = 80 + 12t - t^2$, where t is time in hours and $t = 0$ corresponds to 9 A.M. what is the rate of increase of the ozone level after 3 hours (i.e. at 12 A.M.)?

A. 6 ppb
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B. 12 ppb

C. 107 ppb

D. 113

18. Suppose that a function f has the property that $f(x + y) = f(x)f(y)$ for all value of x and y and that $f(0) = 2$, $f'(0) = 1$. Then which one of the following represents the formula for the derivative $f'(x)$?

A. $f'(x) = 2f'(x) + 1$

B. $f'(x) = f(x) + 2f'(x)$

C. $f'(x) = f(x) + 2$

D. $f'(x) = 2f(x) - 1$

19. if $f(2) = -3$, $f'(2) = 4$, $g(1) = -5$, $g'(1) = 1$ and $f(x) = f(2x + 2)$, $g(1 - x^2)$, then what is the value of $F'(0)$?

A. 19

B. 0

C. -20

D. -40

20. For what values of a and b is the function

$$f(x) = \begin{cases} 1 - 3x^2, & \text{for } x \leq 1 \\ ax + b, & \text{for } x > 1 \end{cases}$$

differentiable at $x = 1$?

A. $a = 6, b = 0$

B. $a = -3, b = 1$

C. $a = 0, b = -2$

D. $a = -6, b =$

21. If $f(x) = 2x^5 - 3x$, then $\lim_{x \rightarrow 1} \frac{f(x) - f(1)}{x - 1}$ is equal to _____.

A. 1

B. -1

C. 7

D. ∞

22. If $f(x) = e^{3x} \cos x - \frac{x + \pi}{x^2 + 2}$, then $f'(0)$ is equal to _____.

A. $3 - \frac{\pi}{2}$

B. $\frac{3}{2}$

C. $\frac{7}{4}$

D. $\frac{5}{2}$

23. If $f(x) = \ln(\sqrt{x^2 - 5})$, which one of the following is equal to $f'(x)$?

A. $\frac{x}{x^2 - 5}$

B. $\frac{-x}{\sqrt{x^2 - 5}}$

C. $\frac{2x}{\sqrt{x^2 - 5}}$

D. $\frac{-x}{x^2 - 5}$

24. $\frac{d}{dx}(Ine^{2x})$ is equal to:

A. $\frac{1}{e^{2x}}$

B. $\frac{2}{e^{2x}}$

C. $2x$

D. 2

25. If $f(x) = 2 + |x - 3|$ for all x , then the value of the derivative $f'(x)$ at $x = 3$ is _____.

A. -1

B. does not exist

C. 1

D. 2

26. If $f(x) = xe^{18} - \cos(2x)$, then $f'(0)$ is equal to

A. 0

B. 2

C. 6

D. 10

27. At what value(s) of x does $f(x) = \frac{1}{3}x^3 - \frac{1}{2}x^2 - 2x + 1$ have a local maximum?

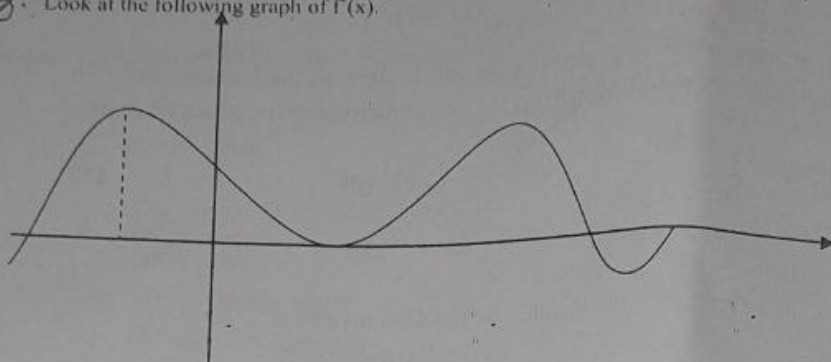
A. $x=2$

B. $x=-1$

C. $x=5$

D. $x=2, x=-1$

28. Look at the following graph of $f(x)$.



Which of the following is true about f ?

A. f is increasing on $[c, d]$

B. f is decreasing on $[b, c]$

C. f has a local minimum at d .

D. f has a local extreme value at c .

29. A rectangular field of length l and width w meters ($w < l$) has perimeter 400 meters. If a circular region of area w^2 is to be reserved for office purpose, what should be the length of the field so that the area of the remaining region is maximum?

A. 50 meters

C. 120 meters

B. 100 meters

D. 150 meters

30. On which of the following intervals is the graph of $f(x) = 2n(x^2+1)$ concave upward?

A. $(-\infty, -1] \cup [1, \infty)$

C. $(-\infty, 0]$

B. $[0, \infty)$

D. $[-1, 1]$

31. On which one of the following intervals does $f(x) = x^4 + 4x$ increase?

A. $(-\infty, -1]$

B. $(-\infty, 0]$

C. $[-1, \infty)$

D. $(-\infty, \infty)$

32. Water is poured into a cylindrical tanker of radius 5 meters at a rate of 10 meter cube/min. what is the rate of change of the height of the level of water when it rises to 3 meters?

A. $\frac{2}{25\pi} \text{ m/min}$

C. $\frac{1}{2\pi} \text{ m/min}$

B. $\frac{2}{5\pi} \text{ m/min}$

D. $\frac{3}{5\pi} \text{ m/min}$

At which value(s) of x does $f(x) = \frac{1}{4}x^4 - 2x^2$ have a local maximum?

A. $x = 4$

B. $x = 0$

C. $x = -2$ and $x = 2$

D. $x = 0$ and $x = 2$

34. The volume V of a melting ice cube after t seconds is $V = 2000 - 40t + 0.2t^2$ (in cm^3). How fast is the volume changing when $t = 40$ seconds?

A. $24\text{cm}^3/\text{sec}$

B. $15\text{cm}^3/\text{sec}$

C. $-15\text{cm}^3/\text{sec}$

D. $-24\text{cm}^3/\text{sec}$

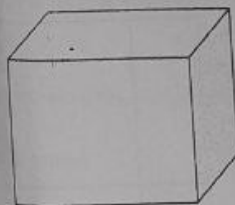
35. A box seen below is to have a square base, and open top and volume of 32 cubic unit. If x is the length of each side of its base and y is its height, how many units should x and y be in order to make the box with the smallest amount of material?

A. $x = 4$, $y = 2$

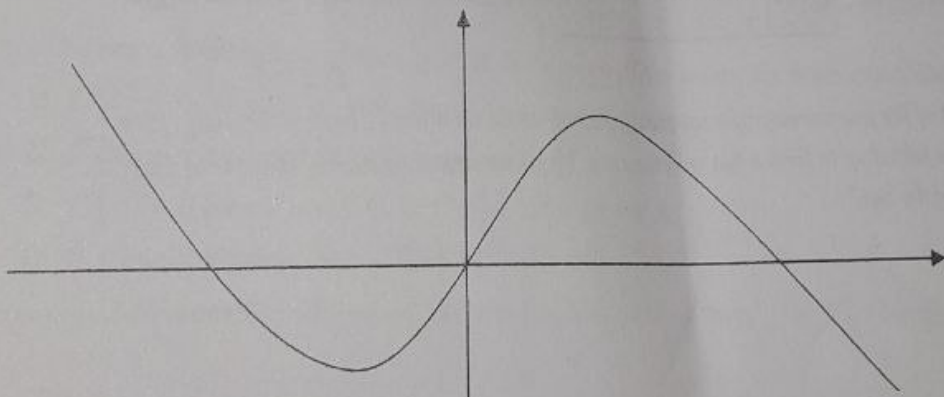
B. $x = 2$, $y = 8$

C. $x = \sqrt{8}$, $y = 4$

D. $x = \sqrt{2}$, $y = 16$



36. Suppose f is differentiable on $(-\infty, \infty)$ and the graph of its derivative is as shown below.



37. Which one of the following is true about f ?

A. f is decreasing on $(-\infty, -1] \cup [1, \infty)$

B. f has a local minimum at $x = -2$

C. f is concave down on $[0, \infty)$

D. f is concave up on $(-1, 1)$

38. The total cost (in Birr) of producing x iron sheets per day is $c(x) = 1,000 + 100x - 0.5x^2$, $0 \leq x \leq 100$. What is the marginal (rate of change of) cost at a production level of 80 iron sheets?

- A. 8.5 B. 20 C. 1,800 D. 5,800

39. A water tank is a circular cylinder with base radius 2m and height 3m. If the tank is empty and water is pumped into it at a rate of $2\text{m}^3/\text{min}$, how long does it take for the tank to be full?

- A. 1.5 min B. $\frac{3}{2}\pi$ min C. 6π min D. 12 min

40. Which one of the following is the set of all critical numbers of $f(x) = \frac{1}{3}x^3 - |4x - 1|$?

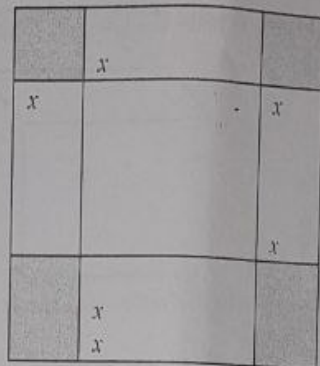
A. $\left\{\frac{1}{4}, 2\right\}$

B. $\left\{-2, \frac{1}{4}, 2\right\}$

$\left\{\frac{1}{4}\right\}$

C. $\{-2, 2\}$

D.



1,200 cm^2 material, what is the largest

41. If a box with square base and open top is made from volume of the box in cm^3 ?

- A. 4,000 B. 8,000 C. 15,000 D. 3,000

42. Suppose that equal squares are cut from each of the four corners of a square cardboard whose sides are 72 centimeters long. [See the figure below.] The resulting flaps are then folded up to form a box without a top. How long should be each of the four squares that has to be cut off to maximize the volume of the box?

- A. 6CM
A. 12CM
B. 15CM
C. 24CM

43. An object is moving along the parabola $y = \sqrt{2x}$ in xy -plane. At what point on its path does the object becomes closest to the point $(2, 0)$?

- A. $(3, \sqrt{6})$ B. $(1, 1)$ C. $(3, \sqrt{2})$ D. $(2, 2)$

44. What is the absolute maximum value of $f(x) = 2x^2 - x^4 - 4$ on $[0, 2]$?

- A. -3 B. 3 C. -4 D. 12

45. A ladder 6 m long rests against a vertical wall. If the bottom of the ladder slides away from the wall at a rate (speed) of $\frac{1}{2}$ m/sec, how fast is the angle between the top of the ladder and the wall changing when the angle is $\frac{\pi}{4}$?

- A. $\frac{\sqrt{2}}{12}$ rad/sec B. $\frac{\sqrt{2}}{2}$ rad/sec C. $\frac{\sqrt{2}}{6}$ rad/sec D. $\frac{\sqrt{2}}{3}$ rad/sec

46. Which one of the following is necessarily true?

- A. If $f'(x) = 0$ for all x in an interval I , then $f(x) = 0$ for all x in I .
B. If $f(x) = x^2 \sin x + 5$, then there is $c \in (0, \pi)$ such $f'(c) = 0$.
C. If $f(x) = ex + x^2$ is increasing on $(-\infty, \infty)$.
D. If $f'(c) = 0$, then f attains its maximum or minimum value at $x = c$.

Let $f(x) = \begin{cases} 3 - e^{2x}, & \text{if } x < 0.5 \\ \frac{2^x - 5}{x + 1}, & \text{if } x \geq 0.5 \end{cases}$. If c is a zero of f , that is, $f(c) = 0$, then which one of the following intervals must contain c ?

A. $(-\infty, 0]$

B. $[0, 1]$

C. $[1, 2]$

D. $[2, 3]$

48. A company manufactures x computer sets per month. The monthly marginal profit (in Birr) is given by:
 $P'(x) = 165 - 0.1x$, for $0 \leq x \leq 400$.
 The company is currently manufacturing 10 sets of computers per month, but is planning to increase production. What is the total change in the monthly profit if the monthly production increased to 60 sets?

A. Birr 500.

B. Birr 1,865.

C. Birr 8,075.

D. Birr 18,635.

49. The total cost (in Birr) of producing x radio sets per day is given by the expression $\frac{1}{4}x^2 + 35x + 25$ and the price set at which they may be sold is given by $50 - \frac{1}{2}x$. What should be the daily output to obtain a maximum total profit?

A. 50 sets per day

B. 23 sets per day

C. 10 sets per day

D. 7 sets per day

50. The number of shoes s that a factory can produce per day is a function of the number of hours t it operates:
 $s(t) = 40t$ for $0 \leq t \leq 12$.
 The daily cost c , in Birr, to manufacture s shoes is given by the function
 $c(s) = 0.1s^2 + 90s + 800$.

If the factory operates for 10 hours, what is the cost it incurs in production as much shoes it can within this time?

A. Birr 400

B. Birr 1,600

C. Birr 52,800

D. Birr 124,600

51. Let f be twice differentiable function on $\mathbb{R}$. Which one of the following is necessarily true?

A. If $f'(c) = 0$, at some $C \in \mathbb{R}$, then f has a relative extreme value at $x = c$.

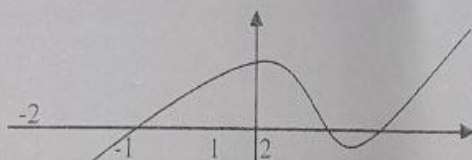
B. If $f'(x)$ is increasing, then the graph of $y = f(x) = 0$ $x \in \mathbb{R}$.

C. If $f'(x) = 0$ for all $x \in \mathbb{R}$ then $f(x) = 0$ for all $x \in \mathbb{R}$.

D. If $f'(x)$ is increasing, then $f''(x) \geq 0$ for $x \in \mathbb{R}$.

52. Suppose f is differentiable on $(-\infty, \infty)$ and the graph of its derivative, $y = f'(x)$ is as shown in the following figure.

$y = f'(x)$



53. Which one of the following is true about $f(x)$?

A. $f(x)$ is increasing on $(-\infty, 0) \cup (2, \infty)$.

B. $f(x)$ has a local extreme value at $x = 2$.

C. $f(x)$ has a local minimum value at $x = -2$.

D. $f(x)$ has a local maximum value at $x = 0$.

54. A closed cylindrical can is to be made to hold 1000 cm^3 of oil. What are the dimensions (radius r and height h) that will minimize the total surface area of the can?

A. $r = \frac{\sqrt[3]{50}}{\pi}$, $h = 2\frac{\sqrt[3]{50}}{\pi}$

C. $r = \frac{\sqrt[3]{50}}{\pi}$, $h = 2\sqrt[3]{\frac{50}{\pi}}$

B. $r = \frac{\sqrt[3]{500}}{\pi}$, $h = 2\frac{\sqrt[3]{500}}{\pi}$

D. $r = \frac{\sqrt[3]{500}}{\pi}$, $h = 2\sqrt[3]{\frac{500}{\pi}}$

55. The graph of $y = 5x^4 - x^5$ has a point of inflection at:

A. $(3, 162)$ only

B. $(4, 256)$ only

C. $(0, 0)$ only

D. $(0, 0)$ and $(3, 162)$

56. Which one of the following is true about the function f defined by $f(x) = x^2 + e^{2x}$?

A. f is decreasing for $x \geq 0$

B. f is increasing for $x \geq 0$

C. f has a relative minimum at $x = 0$

D. f has a relative maximum at $x = 0$

Chapter- 8

1. Which of the following is an ant derivative of $f(x) = \tan x$?

A. $\frac{1}{2} \tan^2 x$

B. $\sec^2 x$

C. $\ln(\cos x)$

D. $\ln(\sec x)$

2. Which of the following is equal to $\int \frac{x}{x^2 + 2x + 1} dx$?

A. $\ln(x^2 + 2x + 1) + c$

B. $\ln|x+1| - \frac{1}{x+1} - c$

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

D. $\ln(x^2 + 2x + 1) + \frac{1}{x+1} + c$

3. $\int \frac{e^{2x} - 4x}{xe^{2x}} dx$ is equal to

A. $\ln|x| + 2e^{-2x} + c$

B. $\ln|x| - 4e^{-2x} + c$

C. $\ln|x| + 4e^{-2x} + c$

D. $-\frac{1}{x^2} + 2e^{-2x} + c$

4. Which of the following is equal to $\int_0^1 \frac{(x-1)^2}{x+1} dx$?

A. $-\frac{3}{2} + \ln 16$

B. $-\frac{5}{2} + \ln 15$

C. $-\frac{5}{2} + 4 \ln 2$

D. $\frac{5}{2} + \ln 16$

5. If $f(x) = \begin{cases} \sin x, & x \leq 0 \\ 3x\sqrt{x^2 + 1}, & x > 0 \end{cases}$, which of the following is equal to $\int_{-\frac{\pi}{2}}^{\sqrt{8}} f(x) dx$?

A. 17

B. 25

C. 27

D. $3\sqrt{8}$

6. The volume of the solid which is generated when the region bounded by $y = \sqrt{x+1}$ and the x -axis from $x = 0$ to $x = 2$ is rotated about the x -axis is equal to

A. 4π

B. 3π

C. $\frac{4}{3}\pi$

D. $\frac{3}{4}\pi$

7. What is an ant derivative of $f(x) = \frac{2}{4x^2 + 4x + 1}$?

A. $\frac{1}{2x+1}$

B. $-\frac{1}{2x+1}$

C. $\frac{-2}{2x+1}$

D. $\ln(4x^2 + 4x + 1)$

60. $f(x) = \begin{cases} x+1, & \text{for } x < 0 \\ \cos \pi x, & \text{for } x \geq 0 \end{cases}$, then $\int_{-1}^1 f(x) dx =$

A. $\frac{1}{2} + \frac{1}{\pi}$

B. $\frac{1}{2} - \frac{1}{\pi}$

C. $\frac{1}{2}$

D. $-\frac{1}{2}$

9. What is the value of $\int_0^{\frac{\pi}{2}} 2x \cos x dx$

A.

B. $\frac{\pi}{2} + 1$

C. $\pi + 2$

D. $\frac{\pi}{2} - 1$

10. Which one of the following is equal to $\int \frac{1}{x^2 + x} dx$?

A. $\ln |x^2 + x| + c$

B. $2 \ln |x-1| + \ln |x| + c$

C. $\ln |x| - \ln |x+1| + c$

D. $\ln |x| + \ln |x+1| + c$

11. Which one of the following is equal to $\int (1+x)3^x dx$?

A. $(1+x)3^x - 3^x + c$

B. $(1+x)3^x - (\log_3 e) 3^x + c$

C. $(1+x)3^x + \log_3 e - (\log_3 e)^2 3^x + c$

D. $(1+x)3^x + \log_3 e - 3^x (\log_3 e) + c$

12. What is the area of the region between the graphs of $y = x^2$ and $y = -x + 2$, where $0 \leq x \leq 2$?

A. 3

B. 2

C. $\frac{3}{2}$

D. $\frac{2}{3}$

13. Which one of the following is equal to $\int \frac{\ln(xe^x)}{x} dx$?

A. $\ln |x| + \frac{1}{2} e^x + c$

B. $\frac{1}{2} (\ln x)^2 + x + c$

C. $\ln |x| + e^x + c$

D. $\frac{1}{x^2} (\ln x)^2 + c$

14. If $F(x)$ is an antiderivative of $f(x) = 1 - \frac{2}{x^2}$ and $F(1) = 0$, then $F'(2)$ is equal to:

A. 0

B. $\frac{1}{2}$

C. $-\frac{1}{2}$

D. 3

15. Which one of the following is equal to $\int_0^{\frac{\pi}{2}} \frac{x - \sin x}{\sec x} dx$?

A. $\frac{\pi - 3}{2}$

B. $\frac{\pi - 1}{2}$

C. $\frac{3 - \pi}{2}$

D. $\frac{\pi + 3}{2}$

16. What is the area of the region between the graphs of $y = -x^2 + 2$ and $y = |x|$, where $-1 \leq x \leq 2$?

A. $\frac{11}{6}$

B. $\frac{25}{6}$

C. $\frac{7}{6}$

D. $\frac{11}{3}$

17. What is the derivative of $f(x) = \int_0^{x^2 + \pi} \frac{dt}{\sin t + 1}$?

A. $\frac{\cos x}{\sin(x^2 + \pi) + 1}$

C. $\frac{2x \cos x}{\sin(x^2 + \pi) + 1}$

B. $\frac{2x}{\sin(x^2 + \pi) + 1}$

D. $\int_0^{2x} \frac{dt}{\sin t + 1}$

18. If Q_i , D_i and P_i are respectively the i^{th} -quartile, decile and percentile of a data arranged in an increasing order, then which one of the following is necessarily true?

A. $Q_2 = \frac{Q_1 + Q_3}{2}$

B. $D_3 > P_{25}$

C. $P_{25} > Q_1$

D. $Q_3 = \text{mean of the data}$

19. The volume of the solid generated when the region bounded between the graph of $y = \begin{cases} x^2, 0 \leq x \leq 2 \\ 4, 2 \leq x \leq 3 \end{cases}$ and x-axis is:

- A. $\frac{32\pi}{5}$ B. $\frac{112\pi}{5}$ C. $\frac{112\pi}{3}$ D. $\frac{64\pi}{5}$

20. Which one of the following is equal to $\int \frac{x + \ln(x+1)}{(x+1)^2} dx$?

- A. $\ln(x+1) + \frac{x}{x+1} + c$ B. $(x+1)^2 + \frac{1}{x+1} + c$ C. $(x+1)^2 - \frac{1}{x+1} + c$ D. $\frac{x \ln(x+1)}{x+1} + c$

21. What is the area of the region between the graph of $f(x) = -x^2 + 4x - 3$ and the x-axis from $x=0$ to $x=3$?

- A. $-\frac{2}{3}$ B. $\frac{2}{3}$ C. $\frac{4}{3}$ D. $\frac{8}{3}$

22. What is the area of the region between the graphs of $y = \sin x$ and x-axis where $0 \leq x \leq 2\pi$?

- A. 4 B. 4π C. 2 D. 2π

23. Which one of the following is equal to $\int \frac{\ln x + x^2 e^x}{x} dx$?

- A. $\frac{1}{2} \ln^2 x + e^x (x^2 - 1) + c$ B. $\frac{1}{2} \ln^2 x + e^x (x - 1) + c$ C. $\frac{1}{x^2} \ln x + e^x (x - 1) + c$ D. $\frac{-1}{x^2} \ln x + e^x (x - 1) + c$

24. The derivative of the function $F(x) = \int_{-x}^x \frac{1}{1+t} dt$ is:

- A. $\frac{2}{1-x^2}$ B. $\ln|1+x|$ C. $\frac{1}{1+x}$ D. $\ln \left| \frac{1+x}{1-x} \right|$

25. If $f(x) = 3x^2 \sqrt{x^3 - 1}$, then which of the following is an anti-derivative of $f(x)$?

- A. $\frac{3x}{2} (x^3 - 1)^{3/2} + c$ B. $\frac{2}{3} (x^3 - 1)^{3/2}$ C. $\frac{3}{2} (x^3 - 1)^{3/2}$ D. $\frac{3}{2} (x^3 - 1)^{2/3} + c$

26. Which of the following is equal to $\int \frac{(\ln x)^2 + x^2 \cos x}{x} dx$?

- A. $\frac{1}{x^2} \ln x + x \sin x - \cos x + c$ B. $\frac{1}{3} (\ln x)^3 + x \sin x - \cos x + c$ C. $\frac{1}{3} (\ln x)^3 + x \sin x + \cos x + c$ D. $\frac{1}{x^2} \ln x + x \sin x + \cos x + c$

27. The value of $\int_0^3 (x+1)e^{(x^2+2x)} dx$ is:

- A. $\frac{e^3}{2}$ B. $\frac{e^4 - e}{2}$ C. $\frac{e^3 - 1}{2}$ D. $e^3 - 1$

28. $\int_0^3 (x+1)^{1/2} dx =$

$\frac{21}{2}$

$\frac{14}{3}$

$a \cdot 7$

$\frac{16}{3}$