



# ST. LAWRENCE HIGH SCHOOL

27, BALLYGUNGE CIRCULAR ROAD



**Class : 12**

**Subject : MATHEMATICS**

**Term : FIRST TERM**

**Max Marks : 60**

**Q 1 :** Which of the following is not an equivalence relation on  $\mathbb{Z}$  ?

**Marks : 1**

- a)  $a R b \Leftrightarrow a + b$  is an even integer.  
 b)  $a R b \Leftrightarrow a - b$  is an even integer.  
 c)  $a R b \Leftrightarrow a < b$   
 d)  $a R b \Leftrightarrow a = b$

1. a  
 2. b  
 3. c  
 4. d

( This Answer is Correct )

**Q 2 :** If  $A = \{1, 2, 3\}$  &  $B = \{1, 4, 6, 9\}$  and  $R$  is a relation from  $A$  to  $B$  defined by " $x$  is greater than  $y$ ; where  $x$  is in  $A$  and  $y$  is in  $B$ ". The range of  $R$  is -

**Marks : 1**

- a)  $\{1, 4, 6, 9\}$  ; b)  $\{4, 6, 9\}$  ; c)  $\{1\}$  ; d) None of these.

1. a  
 2. b  
 3. c  
 4. d

( This Answer is Correct )

**Q 3 :**  $A = [a_{ij}]$  is a  $3 \times 2$  matrix whose elements are given by  $a_{ij} = 3i - 2j$ . then  $A$  will be -

**Marks : 1**

- a)  $\begin{bmatrix} 1 & 1 \\ 4 & 2 \\ 7 & 5 \end{bmatrix}$  b)  $\begin{bmatrix} 1 & -1 \\ 4 & 2 \\ 7 & 5 \end{bmatrix}$  c)  $\begin{bmatrix} -1 & -1 \\ 4 & 2 \\ 7 & 5 \end{bmatrix}$  d)  $\begin{bmatrix} 1 & -1 \\ 4 & -2 \\ 7 & 5 \end{bmatrix}$

1. a  
 2. b  
 3. c  
 4. d

( This Answer is Correct )

**Q 4 :** The value of  $\cos \theta \begin{bmatrix} \cos \theta & \sin \theta \\ -\sin \theta & \cos \theta \end{bmatrix} + \sin \theta \begin{bmatrix} \sin \theta & -\cos \theta \\ \cos \theta & \sin \theta \end{bmatrix} = ?$

**Marks : 1**

- a)  $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$  ; b)  $\begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$  ; c)  $\begin{bmatrix} 0 & 0 \\ 1 & 0 \end{bmatrix}$  ; d)  $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

1. a  
 2. b  
 3. c  
 4. d

( This Answer is Correct )

**Q 5 :** 
$$\begin{vmatrix} 1 & a & b+c \\ 1 & b & c+a \\ 1 & c & a+b \end{vmatrix} = ?$$

Marks : 1

- a) 1 ;    b) -1 ;    c) 0 ;    d) 2

1. a  
2. b  
**3. c**  
4. d

( This Answer is Correct )

**Q 6 :** 
$$\begin{vmatrix} 5^2 & 5^3 & 5^4 \\ 5^3 & 5^4 & 5^5 \\ 5^8 & 5^6 & 5^7 \end{vmatrix} = ?$$

Marks : 1

- a) 1 ;    b) -1 ;    c) 0 ;    d) 2

1. a  
2. b  
**3. c**  
4. d

( This Answer is Correct )

**Q 7 :** The value of  $\lim_{x \rightarrow 1} \frac{\log x}{x-1} = ?$

Marks : 1

- a) 1 ,    b) 0 ,    c) e ,    d) -1

- 1. a**  
2. b  
3. c  
4. d

( This Answer is Correct )

**Q 8 :**  $\int \sin x^\circ dx$  is -

a)  $\frac{\pi}{180} \cos x^\circ + c$   
b)  $\frac{180}{\pi} \cos x^\circ + c$   
c)  $-\frac{180}{\pi} \cos x^\circ + c$   
d)  $-\frac{\pi}{180} \cos x^\circ + c$

Marks : 1

1. a  
2. b  
**3. c**  
4. d

( This Answer is Correct )

**Q 9 :**  $\int \frac{2-3 \sin x}{\cos^2 x} dx = ?$

a)  $2 \tan x - 3 \sec x + c$   
b)  $\tan x - 3 \sec x + c$   
c)  $2 \tan x - \sec x + c$   
d)  $3 \tan x - 2 \sec x + c$

Marks : 1

- 1. a**  
2. b  
3. c

( This Answer is Correct )

4 . d

**Q 10 :** The order of differential equation obtained by the elimination of the arbitrary constants a, b, c from the equation  $ax + by + c = 0$  is -

- 2
- 3
- 1
- None of these

Marks : 1

1 . a

 ( This Answer is Correct )

2 . b

3 . c

4 . d

**Q 11 :** The order of differential equation  $\left(\frac{d^4y}{dx^4}\right)^3 - \frac{d^3y}{dx^3} = \sqrt{1 + \frac{dy}{dx}}$  is -

- 6
- 4
- 3
- 7

Marks : 1

1 . a

2 . b

 ( This Answer is Correct )

3 . c

4 . d

**Q 12 :** The integrating factor of the differential equation  $x \frac{dy}{dx} - y = x^2$  is -

- $1/x$
- $e^x$
- $e^{2\log x}$
- $e^{-2\log x}$

Marks : 1

1 . a

 ( This Answer is Correct )

2 . b

3 . c

4 . d

**Q 13 :** The integrating factor of the differential equation  $x \log x \frac{dy}{dx} + y = \frac{2}{x} \log x$  is -

- $x^2$
- $\log x$
- $\frac{1}{x}$
- $\frac{1}{x^2}$

Marks : 1

1 . a

2 . b

 ( This Answer is Correct )

3 . c

4 . d

**Q 14 :**  $\int_0^\pi \sin 3x \sin 5x dx = ?$

Marks : 1

a)  $\frac{\pi}{2}$     b) 0    c) 1    d) None of these

- 1 . a
- 2 . b
- 3 . c
- 4 . d

( This Answer is Correct )

**Q 15 :** If the function  $f(x)$  is differentiable at  $x = a$ , then it is increasing at  $x = a$  when -

- a)  $f'(a) > 0$
- b)  $f'(a) < 0$
- c)  $f'(a) \geq 0$
- d)  $f'(a) \leq 0$

**Marks :** 1

- 1 . a
- 2 . b
- 3 . c
- 4 . d

( This Answer is Correct )

**Q 16 :** A function  $f(x)$  is defined in  $a \leq x \leq b$  and  $a < x_1 < x_2 < b$  Then  $f(x)$  is strictly monotonic decreasing in  $a \leq x \leq b$  when -

- a)  $f(x_2) > f(x_1)$  when  $x_2 > x_1$
- b)  $f(x_2) < f(x_1)$  when  $x_2 > x_1$
- c)  $f(x_2) > f(x_1)$  when  $x_2 < x_1$
- d)  $f(x_2) < f(x_1)$  when  $x_2 < x_1$ .

**Marks :** 1

- 1 . a
- 2 . b
- 3 . c
- 4 . d

( This Answer is Correct )

**Q 17 :** The slope of the normal to the circle  $x^2 + y^2 = a^2$  at  $(a \cos \theta, b \sin \theta)$  is -

- a)  $-\cot \theta$
- b)  $-\tan \theta$
- c)  $\tan \theta$
- d)  $\cot \theta$

**Marks :** 1

- 1 . a
- 2 . b
- 3 . c
- 4 . d

( This Answer is Correct )

**Q 18 :** The binary operation  $*$  is defined on  $\mathbb{N}$ , by  $a * b = a + b + ab; \forall a, b \in \mathbb{N}$  is -

- a) Associative only
- b) Commutative only
- c) Commutative and associative both
- d) None of these.

**Marks :** 1

- 1 . a
- 2 . b
- 3 . c
- 4 . d

( This Answer is Correct )

- Q 19 :** If the positions vectors of the points P and Q be  $\vec{x}$  &  $\vec{y}$  respectively, then  $\vec{PQ}$  is ? **Marks : 1**
- a)  $\vec{x} + \vec{y}$  ; b)  $\vec{x} - \vec{y}$  ; c)  $\vec{y} - \vec{x}$  ; d)  $\frac{\vec{x} + \vec{y}}{2}$
1. a
  2. b
  - 3. c**  ( This Answer is Correct )
  4. d

- Q 20 :** Let R be a relation on the set  $\mathbb{N}$  given by  $R = \{(a, b) : a = b - 2, b > 6\}$ . Then - **Marks : 1**
- a)  $(2, 4) \in R$  , b)  $(3, 8) \in R$  , c)  $(6, 8) \in R$  , d)  $(8, 7) \in R$
1. a
  2. b
  - 3. c**  ( This Answer is Correct )
  4. d

- Q 21 :** Let  $R = \{(a, a), (b, b), (c, c), (a, b)\}$  be a relation on a set  $A = \{a, b, c\}$ . Then, R is- **Marks : 1**
- a) Transitive ; b) Reflexive ; c) Symmetric ; d) None of these.
1. a
  - 2. b**  ( This Answer is Correct )
  3. c
  4. d

- Q 22 :** If  $2 \begin{bmatrix} 1 & 3 \\ 0 & x \end{bmatrix} + \begin{bmatrix} y & 0 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 5 & 6 \\ 1 & 8 \end{bmatrix}$ , then the values of  $x$  &  $y$  are - **Marks : 1**
- a)  $(3, 3)$  ; b)  $(3, 2)$  ; c)  $(2, 3)$  ; d)  $(1, 1)$
- 1. a**  ( This Answer is Correct )
  2. b
  3. c
  4. d

- Q 23 :** If  $A = \begin{pmatrix} 1 & 2 & 3 & 4 \end{pmatrix}$  &  $B = \begin{pmatrix} 1 \\ 2 \\ 3 \\ 4 \end{pmatrix}$  find  $AB = ?$  **Marks : 1**
- a)  $[30]$  ; b)  $[20]$  ; c)  $30$  ; d)  $20$
- 1. a**  ( This Answer is Correct )
  2. b
  3. c
  4. d

**Q 24 :** The value of  $\begin{vmatrix} a+ib & c+id \\ -c+id & a-ib \end{vmatrix} = ?$

**Marks :** 1

- a)  $d^2 + c^2 + b^2 + a^2$  ; b)  $d^2 + c^2 + b^2 - a^2$  ; c)  $d^2 + c^2 - b^2 + a^2$   
d)  $d^2 - c^2 + b^2 + a^2$

1. a  
2. b  
3. c  
4. d

( This Answer is Correct )

**Q 25 :** If two rows (or two columns) of  $|A|$  are identical, then  $|A| = ?$

**Marks :** 1

- a) 1 ; b) 1 ; c) 0 ; d) -2

1. a  
2. b  
3. c  
4. d

( This Answer is Correct )

**Q 26 :**  $\frac{Adj.A}{|A|} =$

**Marks :** 1

- a)  $A^T$   
b)  $A^{-1}$   
c)  $(A^T)^{-1}$   
d)  $(A^{-1})^T$

1. a  
2. b  
3. c  
4. d

( This Answer is Correct )

**Q 27 :** Which of the following statements is false -

**Marks :** 1

- a)  $(A^{-1})^{-1} = A$   
b)  $(A^T)^{-1} \neq (A^{-1})^T$   
c)  $A^{-1} \cdot A = A \cdot A^{-1} = I$   
d)  $(AB)^{-1} = B^{-1} \cdot A^{-1}$

1. a  
2. b  
3. c  
4. d

( This Answer is Correct )

**Q 28 :**  $\begin{vmatrix} 1 & \omega & \omega^2 \\ \omega & \omega^2 & 1 \\ \omega^2 & 1 & \omega \end{vmatrix} = ?$ , where  $\omega$  is an imaginary cube root of unity.

**Marks :** 1

- a) 1 ; b) 0 ; c) 3 ; d) 2

1. a  
2. b

( This Answer is Correct )

3. c

4. d

**Q 29 :** The value of  $\lim_{x \rightarrow 0} \frac{\log(1+\sin x)}{x} = ?$

Marks : 1

a) 1 , b)  $\log_a e$  , c) 0 , d) e

1. a

( This Answer is Correct )

2. b

3. c

4. d

**Q 30 :** The value of  $\lim_{x \rightarrow 0} \frac{\sin \log(1+x)}{x} = ?$

Marks : 1

a) 0 , b)  $\log_a e$  , c) 1 , d) e

1. a

2. b

3. c

( This Answer is Correct )

4. d

**Q 31 :** The function  $f(x)$  is continuous at  $x=0$  if -

Marks : 1

- $\lim_{x \rightarrow 0} f(x)$  exists.
- $f(0)$  is infinite.
- $\lim_{x \rightarrow 0} f(x) = f(0)$
- $\lim_{x \rightarrow 0^+} f(x) = \lim_{x \rightarrow 0^-} f(x)$

1. a

2. b

3. c

( This Answer is Correct )

4. d

**Q 32 :** Let the function  $f(x) = |x|$ . Then at  $x = 0$  the function is -

Marks : 1

- Not Continuous.
- Continuous but not differentiable
- Differentiable but not Continuous
- Differentiable and Continuous.

1. a

2. b

( This Answer is Correct )

3. c

4. d

**Q 33 :** 1

Marks :

If the derivative of a function is  $\sqrt{x}$ , then the function is -

- a)  $\frac{1}{2\sqrt{x}} + c$   
 b)  $\frac{2}{3}x^{\frac{3}{2}} + c$   
 c)  $\frac{3}{2}x^{\frac{3}{2}} + c$   
 d)  $\frac{2}{3\sqrt{x}} + c$

1. a  
 2. b  
 3. c  
 4. d

 ( This Answer is Correct )
Q 34 :  $\int \frac{x^2+1}{x} dx = ?$ 

Marks : 1

- a)  $\frac{1}{2}x^2 + \log|x| + c$   
 b)  $\frac{1}{2}x^2 + \log x + c$   
 c)  $x + \log|x| + c$   
 d)  $x^2 + \log|x| + c$

1. a  
 2. b  
 3. c  
 4. d

 ( This Answer is Correct )
Q 35 : The value of  $\int \frac{dx}{9x^2+4} = ?$ 

Marks : 1

- a)  $\frac{1}{2} \tan^{-1} \frac{3x}{2} + c$   
 b)  $\frac{1}{6} \tan^{-1} \frac{3x}{2} + c$   
 c)  $\frac{1}{6} \tan^{-1} \frac{2x}{3} + c$   
 d)  $\frac{2}{27} \tan^{-1} \frac{3x}{2} + c$

1. a  
 2. b  
 3. c  
 4. d

 ( This Answer is Correct )

Q 36 : The integral of the form

Marks : 1

 $\int \frac{dx}{(px+q)\sqrt{ax^2+bx+c}}$  can be obtained by the substitution-

- a)  $px + q = \frac{1}{z}$   
 b)  $ax^2 + bx + c = z^2$   
 c)  $ax^2 + bx + c = z$   
 d)  $px + q = \frac{1}{z^2}$

1. a  
 2. b  
 3. c  
 4. d

 ( This Answer is Correct )

Q 37 : 1



If  $\int \frac{dx}{x^2-a^2} = k \log \left| \frac{x-a}{x+a} \right| + c$ , then the value of k is -

Marks : 1

- a)  $\frac{1}{a}$   
 b)  $\frac{1}{2a}$   
 c)  $2a$   
 d) None of these.

- 1 . a  
 2 . b  
 3 . c  
 4 . d

( This Answer is Correct )

**Q 38 :** The degree of the differential equation  $\left(\frac{dy}{dx}\right)^2 - 2\frac{dy}{dx} = 3x$  is -

Marks : 1

- a. 1  
 b. 2  
 c. 3  
 d. 4

- 1 . a  
 2 . b  
 3 . c  
 4 . d

( This Answer is Correct )

**Q 39 :**  $\frac{d^3y}{dx^3} + y = \sqrt[3]{1 + \frac{dy}{dx}}$  is a differential equation of degree -

Marks : 1

- a. 1  
 b. 2  
 c. 3  
 d. 4

- 1 . a  
 2 . b  
 3 . c  
 4 . d

( This Answer is Correct )

**Q 40 :** In the linear differential equation of the form  $\frac{dy}{dx} + Py = Q$ , Q is -

Marks : 1

- a. A constant.  
 b. A constant or a function of x.  
 c. Function of y.  
 d. Function of both x & y.

- 1 . a  
 2 . b  
 3 . c  
 4 . d

( This Answer is Correct )

**Q 41 :** The integrating factor of the differential equation  $\frac{dx}{dy} + Px = Q$  is -

Marks : 1

- a.  $e^x$   
 b.  $e^{Px}$   
 c.  $e^{\int Pdx}$   
 d.  $e^{\int Pdy}$

- 1 . a  
 2 . b

3 . c

4 . d

 ( This Answer is Correct )Q 42 :  $\int_0^{\pi} \sqrt{1 + \sin x} dx = ?$ 

Marks : 1

a)  $\frac{\pi}{4}$     b) 0    c) 4    d) None of these

1 . a

2 . b

3 . c

4 . d

 ( This Answer is Correct )Q 43 : If  $0 < x < \frac{\pi}{2}$  then ,

Marks : 1

- i.  $\sin x$  is an increasing function ;
- ii.  $\cos x$  is an increasing function ;
- iii.  $\tan x$  is an increasing function .

Then -

- a) i. and ii. are true
- b) ii. and iii. Are true
- c) i. and iii. Are true
- d) only i. is true.

1 . a

2 . b

3 . c

4 . d

 ( This Answer is Correct )Q 44 : If the tangent to the continuous curve  $y = f(x)$  at  $P(a, b)$  is parallel to y-axis, then the equation of the normal to the curve at P is -

Marks : 1

- a)  $y = a$
- b)  $y = b$
- c)  $x = a$
- d)  $x = b$

1 . a

2 . b

3 . c

4 . d

 ( This Answer is Correct )Q 45 : The slope of the normal to the parabola  $x^2 = 4ay$  at  $(2at, at^2)$  is -

Marks : 1

- a)  $\frac{1}{t}$
- b) t
- c) - t
- d)  $-\frac{1}{t}$

1 . a

2 . b

3 . c


4 . d

 ( This Answer is Correct )

- Q 46 :** The length of the tangent drawn from the point  $(-4, 5)$  to the circle  $x^2 + y^2 = 16$  is –
- 3 unit
  - 4 unit
  - 5 unit
  - 6 unit

Marks : 1


- a
- b
- 3 . c**
- d

 ( This Answer is Correct )

- Q 47 :** For any non-empty set A, the identity mapping on A will be –
- Injective but not surjective.
  - Surjective but not injective.
  - Bijjective
  - Neither surjective nor injective.

Marks : 1


- a
- b
- 3 . c**
- d

 ( This Answer is Correct )

- Q 48 :** Two functions  $f$  &  $g$  are defined on  $\mathbb{R}$  by  $f(x) = \cos x$  &  $g(x) = x^2$ ; then  $(g \circ f)(x) = ?$
- $\cos^2 x$  ;
  - $\cos x^2$  ;
  - $\sin^2 x$  ;
  - $\sin x^2$

Marks : 1


- 1 . a**
- b
- c
- d

 ( This Answer is Correct )

- Q 49 :** If the binary operation  $*$  is defined on  $\mathbb{Z}$ , by  $a * b = a^2 - b^2 + ab + 4$ , then the value of  $(2 * 3) * 4$  is –
- 233 ;
  - 33 ;
  - 55 ;
  - 55

Marks : 1


- a
- 2 . b**
- c
- d

 ( This Answer is Correct )

- Q 50 :** If  $\vec{a} = 2\hat{i} - \hat{j}$  and  $\vec{b} = 3\hat{i} - 2\hat{j} + 4\hat{k}$ , then the value of  $\vec{a} \times \vec{b}$  is –
- $4\hat{i} - 8\hat{j} - \hat{k}$
  - $-4\hat{i} - 8\hat{j} + \hat{k}$
  - $4\hat{i} - 8\hat{j} + \hat{k}$
  - $-4\hat{i} - 8\hat{j} - \hat{k}$

Marks : 1

- a
- b
- c
- 4 . d**

 ( This Answer is Correct )

**Q 51 :** The Direction cosines of z-axis are ?  
a) 1, 0, 0 ; b) 0, 1, 0 ; c) 0, 0, 1 ; d) 1, 1, 1

Marks : 1

1. a
2. b
3. c
4. d

( This Answer is Correct )

**Q 52 :** State which of the following statements for the square matrix  $A = [a_{ij}]$  is false

Marks : 1

- a)  $\{(I) a_{ij} = 0, \forall i \neq j \text{ \& } (II) a_{ij} = k, \forall i = j, \text{ where } k \neq 0\}$  will form a scalar matrix.
- b)  $\{(I) a_{ij} = 0, \forall i = j \text{ \& } (II) a_{ij} = 1, \forall i \neq j\}$  will form a unit matrix.
- c)  $\{(I) a_{ij} = 0, \forall i \neq j \text{ \& } (II) a_{ij} \neq 0, \forall i = j\}$  will form a diagonal matrix.
- d) If  $A$  is diagonal and all the elements of its principle diagonal are same,  $A$  is scalar matrix.

1. a
2. b
3. c
4. d

( This Answer is Correct )

**Q 53 :** If  $A = \begin{bmatrix} 1 & 2 & 3 \\ -3 & 2 & -1 \\ 2 & -4 & 3 \end{bmatrix}$ , then the Cofactor of  $a_{23}$  (i.e.  $C_{23}$ ) is = ?

Marks : 1

- a) 8 ; b) -8 ; c) -3 ; d) 3

1. a
2. b
3. c
4. d

( This Answer is Correct )

**Q 54 :** If  $f(x) = \begin{vmatrix} \sin x & \cos x & \tan x \\ x^3 & x^2 & x \\ 2x & 1 & 1 \end{vmatrix}$ , then  $\lim_{x \rightarrow 0} \frac{f(x)}{x^2} = ?$

Marks : 1

- a) -1 ; b) 1 ; c) 0 ; d) -2

1. a
2. b
3. c
4. d

( This Answer is Correct )

**Q 55 :** The greatest integer function  $f(x) = [x]$  is -

Marks : 1

- a) Continuous at all real values of x
- b) Continuous only at non-integral values of x
- c) Continuous at all integral values of x
- d) None of these.

1. a
2. b
3. c

( This Answer is Correct )

4. d

**Q 56 :** The order of the differential equation  $\left(\frac{d^2y}{dx^2}\right)^3 - \left(\frac{dy}{dx}\right)^4 + 5y = x$  is -  
 a. 1  
 b. 2  
 c. 3  
 d. 4

Marks : 1

1. a

2. b

3. c

4. d

 ( This Answer is Correct )

**Q 57 :** The integrating factor of the differential equation  $(x + y + 1)\frac{dy}{dx} = 1$  is -  
 a.  $e^{-y}$   
 b.  $e^x$   
 c.  $e^{-x}$   
 d.  $e^y$

Marks : 1

1. a

2. b

3. c

4. d

 ( This Answer is Correct )

**Q 58 :** The slope of the normal to the rectangular hyperbola  $xy = 4$  at  $(2t, \frac{2}{t})$  is -  
 a)  $-t^2$   
 b)  $t^2$   
 c)  $2t$   
 d)  $-2t$

Marks : 1

1. a

2. b

3. c

4. d

 ( This Answer is Correct )

**Q 59 :** The minimum value of the function  $f(x) = x^3 - 3x^2 + 5$  is ?  
 a) 5 ; b) 0 ; c) 2 ; d) 1

Marks : 1

1. a

2. b

3. c

4. d

 ( This Answer is Correct )

**Q 60 :** If  $\vec{a} = 2\hat{i} - \hat{j} + \hat{k}$  and  $\vec{b} = -\hat{i} + 3\hat{j} + 4\hat{k}$ , then the value of  $\vec{a} \cdot \vec{b}$  is -  
 a) 1 ; b) -1 ; c) 3 ; d) -3

Marks : 1

1. a

2. b

3. c

 ( This Answer is Correct )

4 . d

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