

PREVIOUS QUESTION AND ANSWERS

MATHEMATICS (311)

1. If $x = a \sin t$ and $y = a \cos t$, then dy/dx at $t = 0$ is: (2022)
a) -1 b) 1 c) $\cot t$ d) 0

Ans) Option d. $\tan 0 = 0$

2. The slope of the line $y + 3 = 0$ is: (2024)
a) 0 b) 1 c) -3 d) -1

Ans) Option a. Equation of a line is $y = mx + c$, where m is the slope.

3. The intercepts made by the line $3x - 2y + 12 = 0$ on the co-ordinate axis are: (2024)

- a) (4 and -6) b) (-4 and 6) c) (-4 and -6) d) (4 and 6)

Ans) Option b. Put $x = 0$ and find y – intercept and put $y = 0$ and find x – intercept.

4. The equation of the line passing through (3,7) and (-2,5) is: (2024)

- a) $2x - 5y = 29$ c) $2x + 5y + 29 = 0$
b) $2x - 5y + 29 = 0$ d) $2x + 5y = 29$

Ans) Option b. Equation of a line passing through 2 points $A(x_1, y_1)$ and $B(x_2, y_2)$ is: $(y - y_1) = [(y_2 - y_1)/(x_2 - x_1)](x - x_1)$.

5. The centre and radius of the circle $4x^2 + 4y^2 - 2x + 3y - 6 = 0$ are: (2016)

- a) $(1/4, 3/8)$ and $\sqrt{109/8}$ c) $(1/4, -3/8)$ and $\sqrt{109/8}$
b) $(-1/4, -3/8)$ and $\sqrt{109/8}$ d) $(-1/4, 3/8)$ and $\sqrt{109/8}$

Ans) Option c. General form of circle is: $x^2 + y^2 + 2gx + 2fy + c = 0$ where, Centre $(-g, -f)$ and radius $\sqrt{g^2 + f^2 - c}$.

6. The principal value of $\cos^{-1}\left(-\frac{1}{2}\right)$ is: (2023)

- a) $-\pi/3$ b) $-\pi/6$ c) $2\pi/3$ d) $5\pi/6$

Ans) Option c. $\cos x = -1/2 = \cos(\pi - \pi/3) = 2\pi/3$.

7. If $A = \begin{bmatrix} 3 & 2 \\ 1 & -1 \end{bmatrix}$ then $|3A|$ equals: (2017)

- a) -45 b) 45 c) -15 d) 15

Ans) Option a. $|3A| = \begin{vmatrix} 9 & 6 \\ 3 & -3 \end{vmatrix} = -27 - 18 = -45$.

8. If $A = \begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 0 \\ 0 & 1 \end{bmatrix}$ then AB is: (2021)

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

Ans) Option c. $AB = \begin{bmatrix} 0+0 & 0+0 \\ 0+0 & 0+0 \end{bmatrix}$

9. If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ then $A + A^T$ is: (2018)

- a) $\begin{bmatrix} 2 & 5 \\ 5 & 8 \end{bmatrix}$ b) $\begin{bmatrix} 2 & 8 \\ 5 & 5 \end{bmatrix}$ c) $\begin{bmatrix} 2 & 5 \\ 8 & 5 \end{bmatrix}$ d) $\begin{bmatrix} 2 & -5 \\ 5 & 8 \end{bmatrix}$

Ans) Option a. $A^T = \begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix}$

10. If $\begin{bmatrix} p+q & 2 \\ 5 & q \end{bmatrix} = \begin{bmatrix} 6 & 2 \\ 5 & 2 \end{bmatrix}$ then value of p is: (2017)

- a) 6 b) 4 c) 8 d) 5

Ans) Option b. $q = 2$, $p + 2 = 6$

11. If $f(x) = x^2$ and $g(x) = 3$ then $f \circ g(x)$ is: (2019)

- a) 12 b) 15 c) 9 d) 18

Ans) Option c. $f \circ g(x) = f(3) = 3^2$.

12. If $f(x) = x + 3$ for x element of \mathbb{R} , then $f^{-1}(x)$ is: (2019)

- a) $x - 3$ b) $x + 3$ c) $1/(x+3)$ d) $1/(x-3)$

Ans) Option a. $y = x + 3$, $x = y - 3$, $y = x - 3$.

13. Which of the following function from \mathbb{Z} to itself are bijective? (2017)

- a) $f(x) = x^3$ b) $f(x) = x + 2$ c) $f(x) = 2x+1$ d) $f(x) = x^3+1$

Ans) Option b. One – One ; $x_1 = x_2$ and Onto $x = y - 2$ is an element of \mathbb{Z} .

14. If a binary operation $*$ is defined on the set \mathbb{Z} of integers as $a*b = 3a - b$ then $(2*3)*4$ is: (2018)

- a) 2 b) 3 c) 4 d) 5

Ans) Option d. $2*3 = 3 \times 2 - 3 = 3$. $3*4 = 3 \times 3 - 4 = 5$.

15. The degree of the differential equation $\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^3 + y^5 = 0$ is: (2016)

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

Ans) Option b.