

1. If $\begin{vmatrix} a & b & c \\ l & m & n \\ p & q & r \end{vmatrix} = 2$, then what is the value

of the determinant $\begin{vmatrix} 6a & 3b & 15c \\ 2l & m & 5n \\ 2p & q & 5r \end{vmatrix}$?

- (a) 10
 (b) 20
 (c) 40
 (d) 60

Ans = d

2. Let X be the set of all graduates in India. Elements x and y in X are said to be related if they are graduates of the same university. Which one of the following statements is correct ?

- (a) Relation is symmetric and transitive only.
 (b) Relation is reflexive and transitive only.
 (c) Relation is reflexive and symmetric only.
 (d) Relation is reflexive, symmetric and transitive. — Ans: d

3. If $x^2 + y^2 = 1$, then what is $\frac{1+x+iy}{1+x-iy}$ equal to ?

- (a) $x - iy$
 (b) $x + iy$
 (c) $2x$
 (d) $-2iy$

Ans: a

4. Consider the following statements :

1. For any three vectors $\vec{a}, \vec{b}, \vec{c}$;
 $\vec{a} \cdot \{(\vec{b} + \vec{c}) \times (\vec{a} + \vec{b} + \vec{c})\} = 0$
 2. For any three coplanar unit vectors $\vec{d}, \vec{e}, \vec{f}$; $(\vec{d} \times \vec{e}) \cdot \vec{f} = 1$

Which of the statements given above is/are correct ?

- (a) 1 only
 (b) 2 only
 (c) Both 1 and 2
 (d) Neither 1 nor 2

Ans: A

Directions : For the next 3 (three) questions to follow :

Consider the following lists :

Each item under List I is associated with one or more items under List II.

List I
 (Function)

List II
 (Property)

- | | |
|-------------|---|
| A. $\sin x$ | 1. Periodic function |
| B. $\cos x$ | 2. Non-periodic function |
| C. $\tan x$ | 3. Continuous at every point on $(-\infty, \infty)$ |
| | 4. Discontinuous function |
| | 5. Differentiable at every point on $(-\infty, \infty)$ |
| | 6. Not differentiable at every point on $(-\infty, \infty)$ |
| | 7. has period π |
| | 8. has period 2π |
| | 9. increases on $(0, \pi/2)$ |
| | 10. decreases on $(0, \pi/2)$ |
| | 11. increases on $(\pi/2, \pi)$ |
| | 12. decreases on $(\pi/2, \pi)$ |

A is associated with

- (a) 1, 3, 5, 8, 9, 12
 (b) 2, 4, 6, 8, 10, 11 — Ans: D
 (c) 1, 3, 5, 7, 10, 11
 (d) None of the above

6. B is associated with

- (a) 2, 3, 5, 8, 9, 12
 (b) 1, 3, 5, 8, 10, 12 — Ans: A
 (c) 1, 3, 5, 8, 9, 12
 (d) None of the above

7. C is associated with

- (a) 1, 4, 6, 7, 9, 11 — Ans: A
 (b) 2, 4, 6, 8, 9
 (c) 1, 4, 6, 7, 9
 (d) None of the above

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8. If p and q are positive integers, then which one of the following equations has $p - \sqrt{q}$ as one of its roots ?

(a) $x^2 - 2px - (p^2 - q) = 0$

(b) $x^2 - 2px + (p^2 - q) = 0$

(c) $x^2 + 2px - (p^2 - q) = 0$

(d) $x^2 + 2px + (p^2 - q) = 0$

Ans: b

9. Given two squares of sides x and y such that $y = x + x^2$. What is the rate of change of area of the second square with respect to the area of the first square ?

(a) $1 + 3x + 2x^2$

(b) $1 + 2x + 3x^2$

(c) $1 - 2x + 3x^2$

(d) $1 - 2x - 3x^2$

Ans: A

10. The planes $px + 2y + 2z - 3 = 0$ and $2x - y + z + 2 = 0$ intersect at an angle $\pi/4$. What is the value of p^2 ?

(a) 24

(b) 12

(c) 6

(d) 3

Ans: A

11. The growth of a quantity $N(t)$ at any instant t is given by $\frac{dN(t)}{dt} = \alpha N(t)$. Given that $N(t) = ce^{kt}$, c is a constant. What is the value of α ?

(a) c

(b) k

(c) $c + k$

(d) $c - k$

Ans: A

12. A circle is drawn with the two foci of an ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ at the end of the diameter. What is the equation to the circle ?

(a) $x^2 + y^2 = a^2 + b^2$

(b) $x^2 + y^2 = a^2 - b^2$

(c) $x^2 + y^2 = 2(a^2 + b^2)$

(d) $x^2 + y^2 = 2(a^2 - b^2)$

Ans: A

13. What is the image of the point $(1, 2)$ on the line $3x + 4y - 1 = 0$?

(a) $(-\frac{7}{5}, -\frac{6}{5})$

(b) $(\frac{7}{8}, \frac{1}{2})$

(c) $(\frac{7}{8}, -\frac{1}{2})$

(d) $(-\frac{7}{5}, \frac{1}{2})$

Ans: A

14. If the product of the roots of the equation $x^2 - 5x + k = 15$ is -3 , then what is the value of k ?

(a) 12

(b) 15

(c) 16

(d) 18

Ans: A

15. Consider the following statements :

1. Every function has a primitive.

2. A primitive of a function is unique.

Which of the statements given above is/are correct ?

(a) 1 only

(b) 2 only

(c) Both 1 and 2

(d) Neither 1 nor 2

Ans: B