# assignment

February 5, 2024

## CBSE 2018 Mathematics Questions: 65.4.2

### Matrices

1. If A is a square matrix of order 3, $|A| = 9$,then write the value of $|2.\text{adj}A|$.
2. If $A$ and $B$ are symmetric matrices, such that $AB$ and $BA$ are both defiend, then prove that $AB - BA$ is a skew symmetric matricx.

### Vectors

3. Find the acute angle between the planes $\overrightarrow{r}.(\hat{i} - 2\hat{j} - 2\hat{k}) = 1$ and $\overrightarrow{r}.(3\hat{i} - 6\hat{j} + 2\hat{k}) = 0$.
4. **X** and **Y** are two points with position vectors $3\overrightarrow{a} + \overrightarrow{b}$ and $\overrightarrow{a} - 3\overrightarrow{b}$ respectively. Write the position vector of a point **Z** which divides the line segment $XY$ in the ratio 2:1 externally.
5. Let $\overrightarrow{a} = \hat{i} + 2\hat{j} - 3\hat{k}$ and $\overrightarrow{b} = 3\hat{i} - \hat{j} + 2\hat{k}$be two vectors.Show that the vectors $(\overrightarrow{a} + \overrightarrow{b}$ and $(\overrightarrow{a} - \overrightarrow{b})$ are perpendicular to each other.
6. Find the value of $x$, for which the four points $A\,(x, -1, -1)$, $B\,(4, 5, 1)$,$C\,(3, 9, 4)$ and $D\,(-4, 4, 4)$ are co-planar.

### Linear Forms

7. Find the length of the intercept, cut off by the plane on the x-axis.

$$2x + y - z = 5$$

### Differentiation

8. If $y = cosec\ (\cot\ \sqrt{x})$, then find $\dfrac{dy}{dx}$.
9. Write the integrating factor of the differential equation $(tan^{-1}y - x)\,dy = (1 + y^2)\,dx$.
10. Solve the following differential equation: $\dfrac{dx}{dy} + x = (tany + sec^2y)$.
11. If $y = (x)^{\cos x} + (\cos x)^{\sin x}$, find $\dfrac{dy}{dx}$.
12. A ladder 13 m long is leaning against a vertical wall.The bottom of the ladder is dragged away from the wall along the ground at the rate of 2 cm/sec. How fast is the height on the wall decreasing when the foot of the ladder is 5 m away from the wall ?

## Probability

13. 12 cards numbered 1 to 12 (one number on one card), are placed in a box and mixed up thoroughly. Then a card is drawn at random from the box. If it is known that number on the drawn card is greater than 5, find the probability that the card bears an odd number.

14. Out of 8 outstanding students of a school, in which there are 3 boys and 5 girls, a team of 4 students is to be selected for a quiz competition. Find the probability that 2 boys and 2 girls are selected.

15. In a multiple choice examination with three possible answers for each of the five questions, what is the probability that a candidate would get four or more correct answerrs just by guessing ?

## Integration

16. Find: $\int x.tan^{-1}x\,dx$

17. Find: $\int \frac{dx}{\sqrt{5-4x-2x^2}}$.

18. Find: $\int_{\frac{-\pi}{4}}^{0} \frac{1+tanx}{1-tanx}\,dx$.

19. Prove that $\int_0^a f(x)\,dx = \int_0^a f(a-x)\,dx$, and hence evaluate $\int_0^1 x^2(1-x)^n\,dx$.

## Functions

20. Let $* : N \times N \to N$ be an operation defined as $a * b = a + ab, \forall a, b \in N$. Check if $*$ is binary operation. If yes, find if it is associative too.