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CBSE Maths Questions 2016

14. Evaluate: $\int (3x+5)\sqrt{5+4x-2x^2} dx$
15. Solve the differential equation:
- $$x \frac{dy}{dx} + y - x + xy \cot x = 0, x \neq 0.$$
16. Solve the differential equation:
- $$(x^2 + 3xy + y^2) dx - x^2 dy = 0$$
- given that $y = 0$ when $x = 1$.
17. Find the angle between the vectors $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ if $\vec{a} = 2\hat{i} - \hat{j} + 3\hat{k}$ and $\vec{b} = 3\hat{i} + \hat{j} - 2\hat{k}$. Also find a vector perpendicular to both.
18. Show that the lines
- $$\frac{x-1}{3} = \frac{y-1}{-1} = \frac{z+1}{0} \quad \text{and} \quad \frac{x-4}{2} = \frac{y}{0} = \frac{z}{-3}$$
- intersect. Find their point of intersection.
19. A committee of 4 students is selected from a group of 7 boys and 4 girls. Find the probability that the committee contains exactly 2 girls, given that at least one girl must be in the committee.
20. Show that the relation R defined by $(a, b)R(c, d) \Rightarrow a+d = b+c$ on the set $A \times A$, where $A = \{1, 2, 3, \dots, 10\}$, is an equivalence relation. Hence write the equivalence class of $(3, 4)$.
21. Solve for x :
- $$\begin{vmatrix} a+x & a-x & a \\ a-x & a+x & a-x \\ a & a-x & a+x \end{vmatrix} = 0$$
22. Show that the height of the cylinder of greatest volume inscribed in a right circular cone of height h and semi-vertical angle α is one-third of the height of the cone, and the greatest volume is
- $$\frac{4}{27}\pi h^3 \tan^2 \alpha.$$
23. Using integration, find the area of the triangle formed by the negative x-axis and the tangent and normal to the circle $x^2 + y^2 = 9$ at the point $(-1, 2\sqrt{2})$.
24. Find the coordinates of the foot of the perpendicular and the perpendicular distance from the point $P(4, 3, 2)$ to the plane $x + 2y + 3z = 2$. Also find the image of P in the plane.
25. A, B, and C throw a pair of dice alternately until one of them gets a total of 9 and wins the game. Find the probability that A wins, if A starts first.
26. A company manufactures two types of cardigans: type A and type B. Type A costs Rs.360 to make and sells for Rs.100 profit. Type B costs

Rs.120 to make and sells for Rs.50 profit. The company can produce at most 300 cardigans and spend at most Rs.72,000 a day. The number of B-type cardigans cannot exceed the

number of A-type by more than 200. Formulate as a linear programming problem and find the maximum profit graphically.