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Your JEE Guide

ISC Class XII · Mathematics

Sample Question Paper 1 · Session 2026-27

Time allowed: 3 hours (plus 15 minutes reading time) **Maximum marks: 80**

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This is an original practice paper written to the CISCE 2027 specimen paper format; it is not issued by CISCE.

General instructions:

1. You are allowed an additional fifteen minutes for only reading the question paper. You must NOT start writing during the reading time.
2. The paper consists of twenty questions and four sections: Sections A, B, C and D.
3. All questions are compulsory.
4. Section A consists of very short answer questions of 1 mark each. Section B consists of short answer questions of 2 marks each. Section C consists of moderately long answer questions of 3 marks each. Section D consists of long answer questions of 5 marks each.
5. Internal choices have been provided in three questions each in Sections B, C and D.
6. While attempting Multiple Choice Questions in Section A, you are required to write only ONE option as the answer.
7. The intended marks for questions or parts of questions are given in brackets [ ].
8. All workings, including rough work, should be done on the same page as, and adjacent to, the rest of the answer.

Section A (20 marks)

1.	**(i)** A relation R on the set {1, 2, 3, 4} is defined by aRb if and only if $\lvert a - b \rvert \le 1$. Then R is: (a) symmetric and transitive but not reflexive (b) an equivalence relation (c) reflexive and symmetric but not transitive (d) reflexive and transitive but not symmetric	1
	(ii) If f: $\mathbb{R} \to \mathbb{R}$ is given by $f(x) = x^3 + 1$, then $f^{-1}(x)$ is: (a) $\frac{1}{x^3+1}$ (b) $\sqrt[3]{x-1}$ (c) $\sqrt[3]{x+1}$ (d) $\sqrt[3]{x} - 1$	1
	(iii) The value of $\cos^{-1}\left(\cos \frac{5\pi}{3}\right)$ is: (a) $\frac{\pi}{3}$ (b) $\frac{2\pi}{3}$ (c) $-\frac{\pi}{3}$ (d) $\frac{5\pi}{3}$	1
	(iv) The value of $\sin\left(\cot^{-1}\frac{5}{12}\right)$ is: (a) $\frac{5}{13}$ (b) $\frac{13}{12}$ (c) $\frac{5}{12}$ (d) $\frac{12}{13}$	1

	(v) A is a square matrix of order 3 with |A| = 5. The value of |adj A| is: (a) 125 (b) $\frac{1}{5}$ (c) 5 (d) 25	1
	(vi) If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, then $A^2 - 5A$ equals: (a) –2I (b) 2I (c) O (d) I	1
	(vii) Statement I: The function f(x) = |x| is continuous at x = 0. **Statement II:** The function f(x) = |x| is differentiable at x = 0. (a) Statement I is true and Statement II is false. (b) Both the statements are false. (c) Statement I is false and Statement II is true. (d) Both the statements are true.	1
	(viii) The corner points of the bounded feasible region of a linear programming problem are (0, 0), (4, 0), (3, 3) and (0, 5). The maximum value of Z = 3x + 2y is: (a) 10 (b) 12 (c) 15 (d) 25	1
	(ix) The radius of a circular ink blot increases at 2 cm/s. The rate at which its area increases when the radius is 5 cm is: (a) 4π cm²/s (b) 20π cm²/s (c) 10π cm²/s (d) 25π cm²/s	1
	(x) $\int \frac{dx}{x^2 + 16}$ equals: (a) $\frac{1}{8}\log\left\|\frac{x-4}{x+4}\right\| + C$ (b) $\frac{1}{16}\tan^{-1}\frac{x}{16} + C$ (c) $\frac{1}{4}\tan^{-1}\frac{x}{4} + C$ (d) $\tan^{-1}\frac{x}{4} + C$	1
	(xi) $\int_0^{\pi/4} \tan^2 x\, dx$ equals: (a) $\frac{\pi}{4}$ (b) $1 + \frac{\pi}{4}$ (c) $\frac{\pi}{4} - 1$ (d) $1 - \frac{\pi}{4}$	1
	(xii) The general solution of $\frac{dy}{dx} = e^{x-y}$ is: (a) $e^y = e^x + C$ (b) $e^y = e^{-x} + C$ (c) $e^{-y} = e^x + C$ (d) $y = x + C$	1
	(xiii) If $\|\vec{a}\| = \sqrt{3}$, $\|\vec{b}\| = 2$ and $\vec{a} \cdot \vec{b} = \sqrt{6}$, the angle between $\vec{a}$ and $\vec{b}$ is: (a) $\frac{\pi}{6}$ (b) $\frac{\pi}{3}$ (c) $\frac{\pi}{2}$ (d) $\frac{\pi}{4}$	1

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	(xiv) The direction cosines of the vector $2\hat{i} - \hat{j} + 2\hat{k}$ are: (a) $-\frac{2}{3}, \frac{1}{3}, -\frac{2}{3}$ (b) $\frac{2}{3}, -\frac{1}{3}, \frac{2}{3}$ (c) 2, –1, 2 (d) $\frac{2}{5}, -\frac{1}{5}, \frac{2}{5}$	1
	(xv) A and B are independent events with P(A) = 0.5 and P(B) = 0.4. Then P(A ∪ B) is: (a) 0.2 (b) 0.5 (c) 0.7 (d) 0.9	1
	(xvi) Assertion: The function f: $\mathbb{R} \to \mathbb{R}$, $f(x) = x^2$ is not one-one. **Reason:** f(–1) = f(1). (a) Both Assertion and Reason are true, and Reason is the correct explanation of Assertion. (b) Both Assertion and Reason are true, but Reason is not the correct explanation of Assertion. (c) Assertion is true and Reason is false. (d) Assertion is false and Reason is true.	1
	(xvii) Assertion: $\int_0^{\pi} \cos x \, dx = 0$. **Reason:** cos x is an odd function. (a) Both Assertion and Reason are true, and Reason is the correct explanation of Assertion. (b) Both Assertion and Reason are true, but Reason is not the correct explanation of Assertion. (c) Assertion is true and Reason is false. (d) Assertion is false and Reason is true.	1
	(xviii) Find the value of k if the vectors $2\hat{i} + 3\hat{j} - \hat{k}$ and $k\hat{i} - 2\hat{j} + 4\hat{k}$ are perpendicular.	1
	(xix) If x = 2 cos θ and y = 3 sin θ, find $\frac{dy}{dx}$ at $\theta = \frac{\pi}{4}$.	1
	(xx) A die is thrown twice. Find the probability that the sum of the numbers is 7, given that the first throw shows 4.	1

Section B (14 marks)

2.	Show that the function f: $\mathbb{N} \to \mathbb{N}$ given by f(x) = 2x + 1 is one-one but not onto.	2
3.	Find $\frac{dy}{dx}$ if $y = (\log x)^x$, x > 1. **OR** Find $\frac{dy}{dx}$ if $y = \sin^{-1}\left(2x\sqrt{1-x^2}\right)$, $-\frac{1}{\sqrt{2}} < x < \frac{1}{\sqrt{2}}$.	2

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4.	Find $\int x\, e^{3x}\, dx$. **OR** Find $\int \frac{dx}{x(x+2)}$.	2
5.	Find the area of the parallelogram whose adjacent sides are $\vec{a} = 2\hat{i} - \hat{j} + 3\hat{k}$ and $\vec{b} = \hat{i} + 2\hat{j} - \hat{k}$. **OR** Find a unit vector perpendicular to both $\hat{i} + \hat{j}$ and $\hat{j} + \hat{k}$.	2
6.	Find the angle between the lines $\vec{r} = (\hat{i} + 2\hat{j}) + \lambda(2\hat{i} + 2\hat{j} + \hat{k})$ and $\vec{r} = (3\hat{i} - \hat{k}) + \mu(\hat{i} + 2\hat{j} + 2\hat{k})$.	2
7.	A bag contains 4 red and 6 black balls. Two balls are drawn at random, one at a time and without replacement. Find the probability that both are red.	2
8.	Solve the differential equation $\frac{dy}{dx} = \frac{x+1}{2-y}$, y ≠ 2.	2

Section C (21 marks)

9.	Show that $A = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$ satisfies $A^2 - 4A + I = O$. Hence find A^{-1}. **OR** Using properties of determinants, prove that $\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} = (a-b)(b-c)(c-a)$.	3
10.	If $y = e^{a \sin^{-1} x}$, –1 < x < 1, show that $(1-x^2)\frac{d^2y}{dx^2} - x\frac{dy}{dx} - a^2 y = 0$.	3
11.	Find the intervals in which $f(x) = x^3 - 12x + 5$ is strictly increasing or strictly decreasing. **OR** Find the equations of the tangent and the normal to the curve $y = x^2 - 2x + 3$ at the point (2, 3).	3
12.	Find $\int \frac{2x+1}{(x-1)(x+3)}\, dx$.	3
13.	Using integration, find the area of the region enclosed by the parabola $y = x^2$ and the line y = x + 6. **OR** Using integration, find the area of the region bounded by the parabola $y^2 = 8x$ and the line x = 2.	3

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14.	Solve the following linear programming problem graphically: Maximise Z = 4x + 3y subject to x + y ≤ 8, 2x + y ≤ 12, x ≥ 0, y ≥ 0.	3
15.	A factory has three machines A, B and C, which make 50%, 30% and 20% of its bolts. Of their output, 1%, 2% and 3% respectively are defective. A bolt picked at random is found to be defective. Find the probability that it was made by machine C.	3

Section D (25 marks)

16.	Use the matrix method to solve: 2x + y – z = –1, x – y + z = 4, 3x + 2y – z = –1.	5
17.	An open box with a rectangular base is made from a sheet of cardboard 16 cm × 10 cm by cutting equal squares of side x cm from each corner and folding up the sides. Find x for which the volume of the box is greatest, and find the greatest volume. **OR** Show that a right circular cone of given slant height l has its greatest volume when its semi-vertical angle is $\tan^{-1}\sqrt{2}$.	5
18.	(a) Find $\int \frac{dx}{x^2+4x+8}$. *[2]* (b) Find $\int \sqrt{x^2+4x+8}\,dx$. *[3]*	5
19.	Solve the differential equation $\frac{dy}{dx} + 2y = e^{-x}$, given that y = 3 when x = 0. **OR** Solve the differential equation $(x^2 - y^2)\,dx + 2xy\,dy = 0$, given that y = 1 when x = 1.	5
20.	(a) Find the shortest distance between the lines $\vec{r} = (\hat{i} - \hat{j}) + \lambda(2\hat{i} + \hat{j} + \hat{k})$ and $\vec{r} = (2\hat{j} + \hat{k}) + \mu(\hat{i} - \hat{j} + 2\hat{k})$. *[3]* (b) Find the Cartesian equation of the plane that contains the first line and is parallel to the second. *[2]* **OR** Two cards are drawn one after the other, with replacement, from a well-shuffled pack of 52 cards. Let X be the number of aces drawn. Find the probability distribution of X, and its mean and variance.	5

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Answers and Marking Scheme

Marks for each step are shown in brackets. Any correct alternative method gets full credit.

Section A (20 marks)

Question 1

(i) **(c)** reflexive and symmetric but not transitive. *Working:* |a − a| = 0 and |a − b| = |b − a|, so R is reflexive and symmetric; (1, 2), (2, 3) ∈ R but (1, 3) ∉ R, so it is not transitive.

(ii) **(b)** $\sqrt[3]{x-1}$. *Working:* $y = x^3 + 1 \Rightarrow x = \sqrt[3]{y-1}$.

(iii) **(a)** $\frac{\pi}{3}$. *Working:* $\cos\frac{5\pi}{3} = \cos\left(2\pi - \frac{\pi}{3}\right) = \cos\frac{\pi}{3}$, and $\frac{\pi}{3}$ lies in the principal range [0, π].

(iv) **(d)** $\frac{12}{13}$. *Working:* If cot θ = 5/12 with θ acute, the sides are 5 and 12 and the hypotenuse is 13, so sin θ = 12/13.

(v) **(d)** 25. *Working:* $|\operatorname{adj} A| = |A|^{n-1} = 5^2 = 25$.

(vi) **(b)** 2I. *Working:* $A^2 = \begin{bmatrix} 7 & 10 \\ 15 & 22 \end{bmatrix}$ and $5A = \begin{bmatrix} 5 & 10 \\ 15 & 20 \end{bmatrix}$, so $A^2 - 5A = \begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix} = 2I$.

(vii) **(a)** Statement I is true and Statement II is false. *Working:* Both one-sided limits at 0 equal f(0) = 0, so f is continuous; the left derivative is −1 and the right derivative is +1, so f is not differentiable at 0.

(viii) **(c)** 15. *Working:* Z = 0, 12, 15, 10 at the four corners; the maximum is 15 at (3, 3).

(ix) **(b)** 20π cm²/s. *Working:* $\frac{dA}{dt} = 2\pi r\frac{dr}{dt} = 2\pi(5)(2) = 20\pi$.

(x) **(c)** $\frac{1}{4}\tan^{-1}\frac{x}{4} + C$. *Working:* $\int \frac{dx}{x^2+a^2} = \frac{1}{a}\tan^{-1}\frac{x}{a} + C$ with a = 4.

(xi) **(d)** $1 - \frac{\pi}{4}$. *Working:* $\int(\sec^2 x - 1)\,dx = [\tan x - x]_0^{\pi/4} = 1 - \frac{\pi}{4}$.

(xii) **(a)** $e^y = e^x + C$. *Working:* Separating, $e^y\,dy = e^x\,dx$, so $e^y = e^x + C$.

(xiii) **(d)** $\frac{\pi}{4}$. *Working:* $\cos\theta = \frac{\sqrt{6}}{2\sqrt{3}} = \frac{1}{\sqrt{2}}$.

(xiv) **(b)** $\frac{2}{3}, -\frac{1}{3}, \frac{2}{3}$. *Working:* The magnitude is $\sqrt{4+1+4} = 3$; divide each component by 3.

(xv) **(c)** 0.7. *Working:* P(A ∩ B) = 0.5 × 0.4 = 0.2, so P(A ∪ B) = 0.5 + 0.4 − 0.2 = 0.7.

(xvi) **(a)** Both Assertion and Reason are true, and Reason is the correct explanation of Assertion. *Working:* Two different inputs, −1 and 1, have the same image 1, which is exactly why f is not one-one.

(xvii) **(c)** Assertion is true and Reason is false. *Working:* $[\sin x]_0^{\pi} = 0$, so the Assertion is true. cos(−x) = cos x, so cos x is even, and the Reason is false.

(xviii) Their dot product is zero: 2k − 6 − 4 = 0 (½), so k = 5 (½).

(xix) $\frac{dy}{dx} = \frac{3\cos\theta}{-2\sin\theta}$ (½); at $\theta = \frac{\pi}{4}$ it is $-\frac{3}{2}$ (½).

(xx) Given the first throw is 4, the sum is 7 only if the second throw is 3 (½). The probability is $\frac{1}{6}$ (½).

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Section B (14 marks)

2. f(a) = f(b) ⇒ 2a + 1 = 2b + 1 ⇒ a = b, so f is one-one (1). Every image 2x + 1 is an odd number ≥ 3, so 2 ∈ ℕ has no pre-image and f is not onto (1).

3. $\log y = x\log(\log x)$ (½). $\frac{1}{y}\frac{dy}{dx} = \log(\log x) + x\cdot\frac{1}{\log x}\cdot\frac{1}{x}$ (1), so $\frac{dy}{dx} = (\log x)^x\left[\log(\log x) + \frac{1}{\log x}\right]$ (½).

OR Put x = sin θ with $-\frac{\pi}{4} < \theta < \frac{\pi}{4}$: y = sin⁻¹(sin 2θ) = 2θ = 2 sin⁻¹x (1). So $\frac{dy}{dx} = \frac{2}{\sqrt{1-x^2}}$ (1).

4. By parts with u = x, dv = $e^{3x}dx$: $\frac{xe^{3x}}{3} - \int\frac{e^{3x}}{3}dx$ (1) $= \frac{e^{3x}}{9}(3x-1) + C$ (1).

OR $\frac{1}{x(x+2)} = \frac{1}{2}\left(\frac{1}{x} - \frac{1}{x+2}\right)$ (1). Integral $= \frac{1}{2}\log\left|\frac{x}{x+2}\right| + C$ (1).

5. $\vec{a}\times\vec{b} = -5\hat{i} + 5\hat{j} + 5\hat{k}$ (1). Area $= |\vec{a}\times\vec{b}| = \sqrt{75} = 5\sqrt{3}$ square units (1).

OR $(\hat{i}+\hat{j})\times(\hat{j}+\hat{k}) = \hat{i} - \hat{j} + \hat{k}$ (1). Unit vector $\pm\frac{1}{\sqrt{3}}(\hat{i} - \hat{j} + \hat{k})$ (1).

6. $\cos\theta = \frac{|2+4+2|}{3\times3} = \frac{8}{9}$ (1½), so $\theta = \cos^{-1}\frac{8}{9}$ (½).

7. P(first red) = 4/10 and P(second red | first red) = 3/9 (1). P(both red) = $\frac{4}{10}\times\frac{3}{9} = \frac{2}{15}$ (1).

8. Separating: (2 – y) dy = (x + 1) dx (1). Integrating: $2y - \frac{y^2}{2} = \frac{x^2}{2} + x + C$ (1).

Section C (21 marks)

9. $A^2 = \begin{bmatrix}7 & 12\\ 4 & 7\end{bmatrix}$, $4A = \begin{bmatrix}8 & 12\\ 4 & 8\end{bmatrix}$, so $A^2 - 4A + I = O$ (1½). Multiplying by A^{-1}: $A - 4I + A^{-1} = O$, so $A^{-1} = 4I - A = \begin{bmatrix}2 & -3\\ -1 & 2\end{bmatrix}$ (1½).

OR $R_2 \to R_2 - R_1$, $R_3 \to R_3 - R_1$ gives rows (0, b – a, b² – a²) and (0, c – a, c² – a²) (1). Taking out (b – a)(c – a): $\begin{vmatrix}1 & b+a\\ 1 & c+a\end{vmatrix} = c - b$ (1½). Value $= (b-a)(c-a)(c-b) = (a-b)(b-c)(c-a)$ (½).

10. $\frac{dy}{dx} = \frac{ay}{\sqrt{1-x^2}}$, so $(1-x^2)\left(\frac{dy}{dx}\right)^2 = a^2y^2$ (1). Differentiating: $(1-x^2)\cdot 2y'y'' - 2x(y')^2 = 2a^2yy'$ (1). Dividing by $2y'$ gives the result (1).

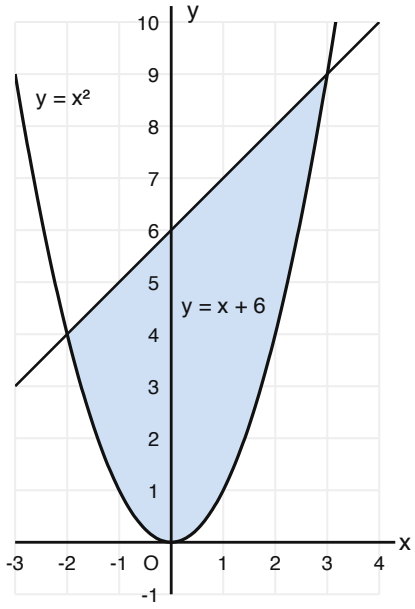
11. $f'(x) = 3(x-2)(x+2)$ (1). f′ > 0 on $(-\infty,-2)\cup(2,\infty)$: strictly increasing there (1); f′ < 0 on (–2, 2): strictly decreasing (1).

OR $\frac{dy}{dx} = 2x - 2 = 2$ at x = 2 (1). Tangent: y – 3 = 2(x – 2), i.e. y = 2x – 1 (1). Normal: $y - 3 = -\frac{1}{2}(x-2)$, i.e. x + 2y – 8 = 0 (1).

12. $\frac{2x+1}{(x-1)(x+3)} = \frac{3/4}{x-1} + \frac{5/4}{x+3}$ (1½). Integral $= \frac{3}{4}\log|x-1| + \frac{5}{4}\log|x+3| + C$ (1½).

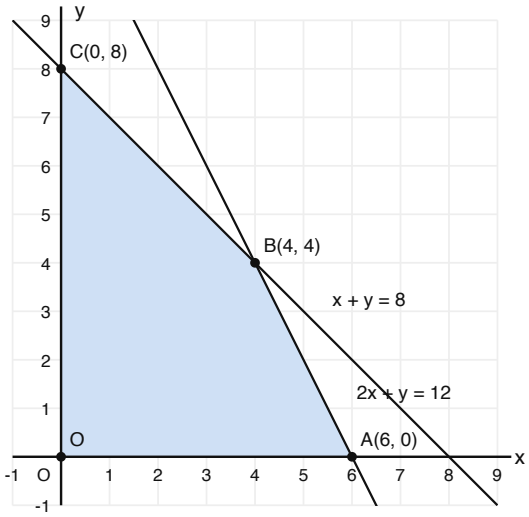
13. They meet where $x^2 = x + 6$, i.e. x = –2 and x = 3 (1). Area $= \int_{-2}^{3}(x + 6 - x^2)\,dx = \left[\frac{x^2}{2} + 6x - \frac{x^3}{3}\right]_{-2}^{3}$ (1) $= \frac{27}{2} + \frac{22}{3} = \frac{125}{6}$ square units (1).

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OR By symmetry, area $= 2\int_0^2 \sqrt{8x}\,dx$ (1) $= 2 \cdot 2\sqrt{2} \cdot \frac{2}{3}\left[x^{3/2}\right]_0^2$ (1) $= \frac{32}{3}$ square units (1).

14. Feasible region OABC (1):



x + y = 8 and 2x + y = 12 meet at B(4, 4) (½). Z(O) = 0, Z(A) = 24, Z(B) = 28, Z(C) = 24 (1). Maximum Z = 28 at x = 4, y = 4 (½).

15. P(D) = 0.5 × 0.01 + 0.3 × 0.02 + 0.2 × 0.03 = 0.005 + 0.006 + 0.006 = 0.017 (1½). By Bayes' theorem, P(C | D) = 0.006/0.017 = $\frac{6}{17}$ (1½).

Section D (25 marks)

16. $A = \begin{bmatrix} 2 & 1 & -1 \\ 1 & -1 & 1 \\ 3 & 2 & -1 \end{bmatrix}$, |A| = 2(1 − 2) − 1(−1 − 3) − 1(2 + 3) = −3 ≠ 0 (1). $\operatorname{adj} A = \begin{bmatrix} -1 & -1 & 0 \\ 4 & 1 & -3 \\ 5 & -1 & -3 \end{bmatrix}$ (2). $X = A^{-1}B = -\frac{1}{3}\begin{bmatrix} -1 & -1 & 0 \\ 4 & 1 & -3 \\ 5 & -1 & -3 \end{bmatrix}\begin{bmatrix} -1 \\ 4 \\ -1 \end{bmatrix} = -\frac{1}{3}\begin{bmatrix} -3 \\ 3 \\ -6 \end{bmatrix}$ (1), so x = 1, y = −1, z = 2 (1).

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17. V = x(16 – 2x)(10 – 2x) = 4x³ – 52x² + 160x, 0 < x < 5 (1). $V' = 12x^2 - 104x + 160 = 4(3x - 20)(x - 2)$ (1). x = 20/3 is outside the domain, so x = 2 (1). $V'' = 24x - 104 = -56 < 0$ at x = 2, a maximum (1). Greatest volume = 2 × 12 × 6 = 144 cm³ (1).

OR With height h, $r^2 = l^2 - h^2$ and $V = \frac{\pi}{3}(l^2 h - h^3)$ (1). $\frac{dV}{dh} = \frac{\pi}{3}(l^2 - 3h^2) = 0$ gives $h = \frac{l}{\sqrt{3}}$ (1½). $\frac{d^2V}{dh^2} = -2\pi h < 0$, a maximum (1). Then $r = l\sqrt{\frac{2}{3}}$, so $\tan\alpha = \frac{r}{h} = \sqrt{2}$ (1½).

18. (a) $x^2 + 4x + 8 = (x + 2)^2 + 2^2$ (1), so the integral is $\frac{1}{2}\tan^{-1}\frac{x+2}{2} + C$ (1). (b) Using $\int \sqrt{u^2 + a^2}\,du = \frac{u}{2}\sqrt{u^2 + a^2} + \frac{a^2}{2}\log\left|u + \sqrt{u^2 + a^2}\right|$ with u = x + 2, a = 2 (1): $\frac{x+2}{2}\sqrt{x^2 + 4x + 8} + 2\log\left|x + 2 + \sqrt{x^2 + 4x + 8}\right| + C$ (2).

19. Linear equation with P = 2; IF $= e^{2x}$ (1). $ye^{2x} = \int e^{-x}e^{2x}dx = e^x + C$ (2). y(0) = 3 gives 3 = 1 + C, C = 2 (1). Solution: $y = e^{-x} + 2e^{-2x}$ (1).

OR $\frac{dy}{dx} = \frac{y^2 - x^2}{2xy}$, homogeneous; put y = vx (1). $x\frac{dv}{dx} = -\frac{1+v^2}{2v}$, so $\frac{2v\,dv}{1+v^2} = -\frac{dx}{x}$ (1½). $\log(1 + v^2) = -\log x + \log C$, i.e. $x^2 + y^2 = Cx$ (1½). y(1) = 1 gives C = 2: $x^2 + y^2 = 2x$ (1).

20. (a) $\vec{b}_1 \times \vec{b}_2 = 3\hat{i} - 3\hat{j} - 3\hat{k}$, magnitude $3\sqrt{3}$ (1). $\vec{a}_2 - \vec{a}_1 = -\hat{i} + 3\hat{j} + \hat{k}$; dot product –3 – 9 – 3 = –15 (1). Shortest distance $= \frac{15}{3\sqrt{3}} = \frac{5}{\sqrt{3}}$ units (1). (b) Normal (1, –1, –1) through (1, –1, 0) (1): (x – 1) – (y + 1) – z = 0, i.e. x – y – z = 2 (1).

OR P(ace) = 1/13. P(X = 0) = $\frac{144}{169}$, P(X = 1) = $2 \cdot \frac{1}{13} \cdot \frac{12}{13} = \frac{24}{169}$, P(X = 2) = $\frac{1}{169}$ (2). Mean $= \frac{24+2}{169} = \frac{2}{13}$ (1). $E(X^2) = \frac{24+4}{169} = \frac{28}{169}$, so variance $= \frac{28}{169} - \frac{4}{169} = \frac{24}{169}$ (2).

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