MATHS

BOOKS - IPUCET PREVIOUS YEAR PAPERS MATHS (HINGLISH)

IPU QUESTION PAPER 2016

Mathematics

1. $\int \frac{x^2-2}{x^3\sqrt{x^2-1}}dx$ equal to

A. $\frac{x^2}{\sqrt{x^2-1}}+C$

B. $-\frac{x^2}{\sqrt{x^2-1}}+C$

C. $\frac{\sqrt{x^2-1}}{x^2}+C$

D. $-\frac{\sqrt{x^2-1}}{x^2}+C$

Answer: D

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2. $\lim_{x \to 0} \frac{\sqrt{1+x} - \sqrt{1-x}}{x}$ is equal to

A. 0

B. 1

C. -1

D. ∞

Answer: B

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3. In how many ways can the four walls of a room be painted with three colours such that no two adjacent walls have the same colour?

A. 2

B. 9

C. 18

D. 24

Answer: D

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4. A die is thrown twice and the sum of the numbers appearing is 6. Then, the conditional probability that the number 4 has appeared at least once is

A. $\frac{1}{5}$

B. $\frac{4}{5}$

C. $\frac{2}{5}$

D. $\frac{2}{36}$

Answer: C

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5. There are 3 true coins and 1 false coin with 'head' on both sides. A coin is chosen at random and tossed 4 times. If 'head' occurs all the 4 times, then the probability that the false coin has been chosen and used is

A. $\frac{15}{19}$

B. $\frac{14}{19}$

C. $\frac{13}{19}$

D. $\frac{16}{19}$

Answer: D

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6. The value of ${}^{40}C_0 + {}^{40}C_1 + {}^{40}C_2 + \ldots . + {}^{40}C_{20}$ is

A. $2^{40} + \frac{40!}{(20!)^2}$

B. $2^{39} - \frac{1}{2} \times \frac{40!}{(20!)^2}$

C. $2^{39} + {}^{40}C_{20}$

D. none of these

Answer: D

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7. If $x = e^{y + e^{y+} - x}$, $x > 0$ then $\frac{dy}{dx}$ is

A. $\frac{1}{x}$

B. $\frac{x}{1+x}$

C. $\frac{1-x}{x}$

D. $\frac{1+x}{x}$

Answer: C

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8. The period of the function

$f(x) = |\sin x| - |\cos x|$ is

A. $\pi/2$

B. π

C. 2π

D. $\frac{3\pi}{2}$

Answer: B

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9. $\int_{-\pi/2}^{\pi/2} |\sin x| dx$ equals to

A. 0

B. 1

C. -1

D. 2

Answer: D

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10. If P(x) is a polynomial such that $\left(x^2+1\right)=\{p(x)\}^2+1$ then P'(0) is equal to

A. 1

B. 0

C. -1

D. none of these

Answer: A

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11. If $y^{\frac{1}{m}} + x^{\frac{1}{m}} = 2x$ then

A. $(x^2+1)\frac{d^2y}{dx^2} + x\frac{dy}{dx} - m^2y = 0$

B. $(x^2-1)\frac{d^2y}{dx^2} + x\frac{dy}{dx} + m^2y = 0$

C. $(x^2-1)\frac{d^2y}{dx^2} + x\frac{dy}{dx} - m^2y = 0$

D. $(x^2+1)\frac{d^2y}{dx^2} - x\frac{dy}{dx} + m^2y = 0$

Answer: C

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12. Tangents are drawn from the origin to the curve y=sin x then ,the point of contact lie on the curve is

A. $y^2 = \frac{x^2}{1-x^2}$

B. $y^2 = \frac{x^2}{1+y}$

C. $x^2 = \frac{y^2}{1+y^2}$

D. $y^2 = \frac{x^2}{1+x^2}$

Answer: D

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13. What is the value of $\tan\left(\frac{\pi}{12}\right)$?

A. $1-\sqrt{3}$

B. $\sqrt{3}-1$

C. $2-\sqrt{3}$

D. $\sqrt{3}-2$

Answer: C

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14. $\int \frac{x^2}{(x\sin x+\cos x)^2}dx$ is equal to

A. $\frac{x\sin x-\cos x}{x\sin x+\cos x}+C$

B. $\frac{\cos x - x \sin x}{x \sin x + \cos x} + C$

C. $\frac{x \cos x - \sin x}{x \sin x + \cos x} + C$

D. $\frac{\sin x - x \cos x}{x \sin x + \cos x} + C$

Answer: D

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15. $\int_0^1 x e^{2x} dx$ is equal to

A. $e^2 - 1$

B. $\frac{1}{4}(e^2 - 1)$

C. $2e^2 + 1$

D. $\frac{1}{4}(e^2 + 1)$

Answer: D

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16. A real solution of the equation cosh x - 5 sinhx x - 5 = 0 is

A. $-$ In 2

B. In 2

C. $-$ In 5

D. none of these

Answer: A

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17. $\int_{-1}^{1} \frac{x \sin^2 x}{\sqrt{1-x^2}} dx$ is equal to

A. 1

B. 0

C. 4

D. 2

Answer: D

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18. On the ellipse ,$9x^2 + 25y^2 = 225$ the point, the distance from which to the focus F_2 is four times the distance to the focus F_1

A. $\left(\frac{-15}{4}, \frac{\sqrt{63}}{4}\right)$

B. $\left(\frac{-15}{4}, \frac{-\sqrt{63}}{4}\right)$

C. $\left(\frac{-1}{15}, \frac{-\sqrt{63}}{4}\right)$ and $\left(\frac{-1}{15}, \frac{\sqrt{63}}{4}\right)$

D. $\left(\frac{-1}{15}, \frac{-\sqrt{63}}{4}\right)$ and $\left(\frac{1}{15}, \frac{\sqrt{63}}{4}\right)$

Answer: B

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19. If the expansion of $\left(x^2+\frac{2}{x}\right)^n$ for positive integer n has a term independent of x, then n is

A. 23

B. 18

C. 16

D. 13

Answer: B

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20. Find the points of intersection of the given surface $\frac{x^2}{81}+\frac{y^2}{36}+\frac{z^2}{9}=1$ and the straight line $\frac{x-3}{3}=\frac{y-4}{-6}=\frac{z+2}{4}$

A. (3,4,-1)

B. (6,-2,2)

C. (3,4,-2) and (6,-2,2)

D. (-3,4,-2) and (6,-2,2)

Answer: C

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21. Let

$a - \cos\theta_1 + i\sin\theta_1 b = \cos\theta_2 + i\sin\theta_2 c = \cos\theta_3 + i\sin\theta_3$ and $a + b + c =$

then

A. 1

B. -1

C. $\sqrt{2}$

D. 0

Answer: D

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22. For any two vectors u and v , if |u+v| = |u -v| then the angle between them is equal to

A. $\frac{\pi}{4}$

B. $\frac{\pi}{3}$

C. $\frac{\pi}{2}$

D. π

Answer: C

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23. Find the derivative of $y^{n+m}\sqrt{(1-x)^m(1+x)^n}$ at x = 0 , where $n, m > 0$

A. 0

B. 1

C. $\frac{n-m}{n+m}$

D. $\frac{m}{n^{n+m}} + m^{\frac{n}{m+n}}$

Answer: C

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24. Angles A, B and C of a ΔABC are in AP and , $b = c = \sqrt{3} : \sqrt{2}$ then the $\angle A$ is given by

A. 45°

B. 60°

C. 75°

D. 90°

Answer: C

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25. The straight line and the plane are $r = (i - j + k) + \lambda(2i + j - k)$ and the plane $r.\ (2i + j - k) = 4$ are

A. perpendicular to each other

B. parallel

C. inclined at an angle 60°

D. inclined at an angle 45°

Answer: A

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26. At what point of the curve $y^2 = 2x^3$ is the tangent line perpendicular to the straight line 4x - 3y + 2 = 0?

A. $\left(\frac{1}{8}, \frac{-1}{16}\right)$

B. $\left(\frac{1}{4}, \frac{-1}{8}\right)$

C. $\left(\frac{-1}{16}, \frac{1}{8}\right)$

D. none of these

Answer: A

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27. Find the real solution of the system of equations.

$x^4 + y^4 - x^2y^2 = 13$

And $x^2 - y^2 + 2xy = 1$

Satisfying the condition $xy \geq 0$

A. $(x = 1, y = -2), (x = -1, y = 2)$

B. $(x = 2, y = 1), (x = -2, y = -1)$

C. $(x = 1, y = 2), (x = -1, y = -2)$

D. $(x = 1, y = -2), (x = -1, y = -2)$

Answer: C

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28. For $x > 1$, how many roots/solutions of the following equation exist.

$$\log_{2x}\left(\frac{2}{x}\right)\log_2^2 x + \log_2^4 x = 1$$

A. None

B. One

C. Two

D. Infinitely many

Answer: B

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29. Solve for $x(x > 0)$

$$\log_{3x}\left(\frac{3}{x}\right) + \log_3^2 x = 1$$

A. x = 1 and there are infinitely more solutions .

B. x = 1 , $x_2 = \frac{1}{3}$ only two solutions

C. x = 1 , $x_2 = 3$ only two solutions

D. x = 1 , $x_2 = 3, x_3 = \frac{1}{3}$ only three solutions

Answer: C

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30. $\int_0^1 x^5 \sqrt{1-x^3} dx$ is equal to

A. $1/15$

B. $2/45$

C. $2/15$

D. $4/45$

Answer: D

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31. $\frac{1}{2\sin 10^\circ} - 2\sin 70^\circ$ is equal to

A. 0

B. $\frac{1}{2}$

C. $\frac{1}{\sqrt{2}}$

D. 1

Answer: D

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32. $(1+2i)^6$ is equal to

A. None of these

B. $-177+44j$

C. $177+44j$

D. $177-44j$

Answer: A

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33. What is the number of ordered pairs of real numbers (a,b) such that $(a+bi)^{2002} = a - bi$?

A. 1001

B. 1002

C. 2004

D. 2002

Answer: C

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34. Which of the following complex numbers is conjugate to its square?

A. $1 - i\sqrt{3}$

B. $-1 - i\sqrt{3}$

C. $\frac{1}{2} - \frac{i\sqrt{3}}{2}$

D. $-\frac{1}{2}+\frac{i\sqrt{3}}{2}$

Answer: D

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35. Given $\varepsilon_k=\cos\left(\frac{2\pi k}{n}\right)+i\sin\left(\frac{2\pi k}{n}\right)$ find the $\Pi_{k=0}^{n-1}\left(\varepsilon_k^2-2\varepsilon_k\cos\theta+1\right)$

A. $2(1-\cos n\theta)$

B. $2(1+\cos n\theta)$

C. $(1-\cos n\theta)^n$

D. $1+\cos^2 n\theta$

Answer: A

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36. $\lim_{x \to \pi/4} \frac{(1-\cos x)^2}{\tan^2 x - \sin^2 x}$ is equal to

A. 0

B. $\left(\sqrt{2-1}\right)^2$

C. 1

D. ∞

Answer: B

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37. $\lim_{n \to \infty} \left[\frac{1}{5} - \frac{1}{25} + ... + (-1)^{n-1}\frac{1}{5^n}\right]$

A. $\frac{1}{2}$

B. $\frac{1}{4}$

C. $\frac{1}{6}$

D. $\frac{1}{8}$

Answer: B

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38. $\lim_{x \to 0} \frac{a^x - 1}{x}$ is equal to

A. a

B. log a

C. 0

D. ∞

Answer: B

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39. $\lim_{x \to 0} \frac{\tan^{-1}\left(\frac{x}{\sqrt{1-x^2}}\right)}{\ln(1-x)}$ is equal to

A. 0

B. 1

C. -1

D. ∞

Answer: C

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40. Find the angles formed by the unit vectors e_1 and e_2 if it is known that the vectors $a = e_1 + 2e_e$ and $b = 5e_1 - 4e_2$ are mutually perpendicular.

A. $\frac{\pi}{4}$

B. $\frac{\pi}{3}$

C. $\frac{\pi}{2}$

D. π

Answer: B

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41. Find the component of the vector a (-1,2,0) perpendicular to the plane of the vectors $e_1[1, 0, 1)$ and $e_2(1, 1, 1)$

A. $\left(-\frac{1}{2}, \frac{1}{2}, 0\right)$

B. $\left(0, -\frac{1}{2}, \frac{1}{2}\right)$

C. $\left(-\frac{1}{2}, 0, \frac{1}{2}\right)$

D. $\left(\frac{1}{2}, 0, \frac{-1}{2}\right)$

Answer: C

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42. $\vec{I} = \sqrt{-1}$ then $\lim_{n \to \infty} \frac{(n + 2i)(3 + 7in)}{(2 - i)(6n^2 + 1)}$ is equal to

A. $-7/5$

B. $\frac{14}{5} - \frac{7}{5}i$

C. $\frac{7}{5} - \frac{14}{5}i$

D. $\frac{-7}{30} + \frac{7}{5}i$

Answer: D

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43. What is the shape of the figure given by the following equations?

i. $16x^2 - 9y^2 - 64x - 54y - 161 = 0$

ii $9x^2 - 16y^2 + 90x - 32y - 367 = 0$

iii. $16x^2 - 9y^2 - 64x - 18y + 199 = 0$

A. Line

B. Ellipse

C. Hyperbola

D. Parabola

Answer: A

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44. What is the equation of the curve in which point M performs its motion, if the sum of the distances from this point to the points A(-1, -1) and B (1, 1) remains constant is equal to $2\sqrt{3}$?

A. $2x^2 - 2xy + 2y^3 - 3 = 0$

B. $2x^2 + 2xy - 2y^3 - 3 = 0$

C. $2x^2 - 2xy - 2y^3 + 3 = 0$

D. $2x^2 + 2xy + 2y^3 - 3 = 0$

Answer: A

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45. Find the component of the vector a (-1,2,0) perpendicular to the plane of the vectors $e_1(1, 0, 1)$ and $e_2(1, 1, 1)$

A. $(1/2, 0, 1/2)$

B. $(-1/2, 0, 1/2)$

C. $(1/2, 0, -1/2)$

D. $(-1/2, 0, -1/2)$

Answer: B

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46. On the sphere $(x-1)^2+(y+2)^2+(z-3)^2=25$ compute the distance from the point M_0 to the plane $3x-4z+19$

A. 1

B. 2

C. 3

D. 4

Answer: A

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47. If $y = \sec\left(\tan^{-1} x\right)$, then y at x = 1 is equal to term is the sum of two preceding terms. Then, the common ratio of the G.P. is

A. $\frac{1}{\sqrt{2}}$

B. $\frac{1}{2}$

C. 1

D. $\sqrt{2}$

Answer: A

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48. $\lim_{x \to \infty} \frac{\ln x}{x^m}$ is equal to point

A. 0

B. 1

C. $-\frac{1}{2}$

D. ∞

Answer: A

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49. Every term of G.P. is positive and also every term is the sum of two preceding terms. Then, the common ratio of the G.P. is

A. $\frac{1-\sqrt{5}}{2}$

B. $\frac{\sqrt{5}+1}{2}$

C. $\frac{\sqrt{5}-1}{2}$

D. 1

Answer: B

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