



MATHS

BOOKS - IPUCET PREVIOUS YEAR PAPERS

MATHS (HINGLISH)

IPU QUESTIONS PAPER 2017

Mathematics

1. Consider line segments of lengths 1, 2, 3, ...10, what is the number of triangles that can be formed from them?

A. 20

B. 30

C. 40

D. 50

Answer: d



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2. Choose the most appropriate options.

The value of $\lim_{x \rightarrow 0} \frac{\int_0^{x^2} \sec^2 t dt}{x \sin x}$ is

A. 0

B. 3

C. 2

D. 1

Answer: d



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3. How many paths are there from the point A to the point B in figure below, if no point in a path is to be traversed more than once



A. 2^3

B. 2^6

C. ${}^{12}C_2$

D. 7

Answer: d



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4. Choose the most appropriate options.

The number of real roots of

$$(6 - x)^4 + (8 - x)^4 = 16$$

A. 0

B. 2

C. 4

D. 6

Answer: d



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5.
$$\begin{vmatrix} a^2 & b^2 & c^2 \\ (a+1)^2 & (b+1)^2 & (c+1)^2 \\ (a-1)^2 & (b-1)^2 & (c-1)^2 \end{vmatrix}$$
 is equal to

A. $-4(a-b)(b-c)(c-a)$

B. $4(a-b)(b-c)(c-a)$

C. $2(a-b)(b-c)(c-a)$

D. 0

Answer: a



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6. Choose the most appropriate options.

The function $f: [0, 3] \rightarrow [1, 29)$ defined by

$$f(x) = 2x^3 - 15x^2 + 36x + 1 \text{ is}$$

- A. one-one and onto
- B. onto but not one one
- C. one-one but not onto
- D. neither one-one nor onto

Answer: b



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7. Choose the most appropriate options.

For all $n \in N$, $7^{2n} - 48n - 1$ is divisible by

A. 25

B. 26

C. 1234

D. 2304

Answer: d



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8. $\sum_{k=0}^5 ({}^5C_k)^2$ is equal to

A. ${}^{25}C_5$

B. ${}^{15}C_5$

C. ${}^{10}C_5$

D. 1

Answer: c



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9. Choose the most appropriate options.

$$\text{If } f(x) = \begin{cases} \frac{1 - \sin x}{(\pi - 2x)^2} & \cdot \frac{\log \sin x}{\log(1 + \pi^2 - 4\pi x + x^2)} \\ k, x = \frac{\pi}{2} \end{cases}$$

$$x \neq \frac{\pi}{2}$$

is continuous at $x = \frac{\pi}{2}$ then k is equal to

A. $-\frac{1}{16}$

B. $-\frac{1}{32}$

C. $-\frac{1}{64}$

D. $-\frac{1}{28}$

Answer: c



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10. The length of the axes of the conic

$$9x^2 + 4y^2 - 6x + 4y + 1 = 0 \text{ are}$$

A. $\frac{1}{2}, 9$

B. $3, \frac{2}{5}$

C. $1, \frac{2}{3}$

D. $3, 2$

Answer: d



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11. Choose the most appropriate options.

Admission aglasem A differentiable function $f(x)$ has a relative minimum at $x = 0$, then the function $y = f(x) + ax + b$ has a relative minimum at $x=0$ for

A. all a and All b

B. all b , if $a=0$

C. all $b > 0$

D. all $a > 0$

Answer: b



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12. The maximum number of points into which 4 circles and 4 straight lines intersect, is

A. 26

B. 50

C. 56

D. 72

Answer: b



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13. Choose the most appropriate options.

The solution of the differential equation

$$(x^2 - yx^2) \frac{dy}{dx} + y^2 + xy^2 = 0 \text{ is}$$

$$\text{A. } \log\left(\frac{x}{y}\right) = \frac{1}{x} + \frac{1}{y} + C$$

$$\text{B. } \log\left(\frac{y}{x}\right) = \frac{1}{x} + \frac{1}{y} + C$$

$$\text{C. } \log(xy) = \frac{1}{x} + \frac{1}{y} + C$$

$$\text{D. } \log(xy) + \frac{1}{x} = \frac{1}{y} = C$$

Answer: a



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14. Given that $\alpha_1, \alpha_2, \alpha_3$ are the roots of

$3x^3 - x^2 - 10x + 8 = 0$ then the value of

$$\alpha_1^2 + \alpha_2^2 + \alpha_3^2$$

A. $9/61$

B. $61/9$

C. $16/9$

D. $9/16$

Answer: b



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15. Choose the most appropriate options.

The area bounded by the curves $y = \cos x$ and $y = \sin x$

between the ordinates $x=0$ and $x = \frac{3\pi}{2}$ is

A. $4\sqrt{2} - 1$

B. $4\sqrt{2} + 1$

C. $4\sqrt{2} - 2$

D. $4\sqrt{2} + 2$

Answer: c



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16. Choose the most appropriate option.

$$\int_0^{\frac{\pi}{2}} \frac{\sqrt{\cos x}}{\sqrt{\sin x} + \sqrt{\cos x}} dx \text{ is equal to}$$

A. 1

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

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

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

Answer: c



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17. Choose the most appropriate options.

The value of the integral $\int_0^{0.9} [x - 2[x]] dx$ where $[.]$

denotes the greatest integer function,

A. 0.9

B. 0

C. 1.8

D. -0.9

Answer: b



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18. Choose the most appropriate option.

The value of $\int_0^{\frac{\pi}{2}} \sin^7 \theta \cos^4 \theta d\theta$ is

A. $\frac{16}{1155}$

B. $\frac{16}{385}$

C. $\frac{16\pi}{385}$

D. $\frac{8\pi}{1155}$

Answer: a



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19. Choose the most appropriate options.

The number of solutions of the equation

$3 \sin^2 x - 7 \sin x + 2 = 0$ in the interval $[0, 5\pi]$ is

A. 0

B. 5

C. 6

D. 10

Answer: c



20. Choose the most appropriate option.

The inverse of matrix $\begin{bmatrix} 0 & 1 & -1 \\ 4 & -3 & 4 \\ 3 & -3 & 4 \end{bmatrix}$ is

A. $\begin{bmatrix} 4 & 1 & -1 \\ 3 & -1 & 3 \\ 4 & -3 & -3 \end{bmatrix}$

B. $\begin{bmatrix} 0 & 1 & -1 \\ 4 & -3 & 4 \\ 3 & -3 & 4 \end{bmatrix}$

C. $\begin{bmatrix} 0 & -1 & 1 \\ 3 & -4 & 4 \\ 4 & 1 & -3 \end{bmatrix}$

D. $\begin{bmatrix} 0 & 1 & 1 \\ -4 & 3 & 4 \\ 3 & -3 & 4 \end{bmatrix}$

Answer: b



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21. Choose the most appropriate options.

If

$$a = \hat{i} + \hat{j}, b = 2\hat{j} - \hat{k} \text{ and } r \times a = b \times ar \times b = a \times b$$

then a unit vector in the direction of r is

A. $\frac{1}{\sqrt{11}} (\hat{i} + 3\hat{j} - \hat{k})$

B. $\frac{1}{\sqrt{11}} (\hat{i} - 3\hat{j} + \hat{k})$

C. $\frac{1}{\sqrt{3}} (\hat{i} + \hat{j} + \hat{k})$

D. None

Answer: a



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22. Choose the most appropriate option.

The solution of the differential equation

$$\frac{d^2y}{dx^2} + 3y = -2x \text{ is}$$

A. $c_1 \cos \sqrt{3}x + c_2 \sin \sqrt{3}x - \frac{2}{3}x$

B. $c_1 \cos \sqrt{3}x + c_2 \sin \sqrt{3}x - \frac{4}{5}$

C. $c_1 \cos \sqrt{3}x + c_2 \sqrt{3}x - 2x^2 + \frac{4}{9}$

D. $c_1 \cos \sqrt{3}x + c_2 \sin \sqrt{3}x - \frac{2}{3}x^2 + \frac{4}{9}$

Answer: a



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23. Choose the most appropriate options.

From the bottom of a pole of height h , the angle of elevation of the top of a tower is α . The pole subtends an angle β at the top of tower. The height of the tower is

A. $\frac{h \sin \alpha \sin(\alpha - \beta)}{\sin \beta}$

B. $\frac{h \sin \alpha \cos(\alpha + \beta)}{\cos \beta}$

C. $\frac{h \sin \alpha \cos(\alpha - \beta)}{\sin \beta}$

D. $\frac{h \sin \alpha \sin(\alpha + \beta)}{\cos \beta}$

Answer: c



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24. Choose the most appropriate option.

If the numbers $a_1, a_2, , \dots, a_n$ are different from zero and form an arithmetic progression, then

$\frac{1}{a_1 a_2} + \frac{1}{a_2 a_3} + \frac{1}{a_3 a_4} + \dots + \frac{1}{a_{n-1} a_n}$ is equal to

A. $\frac{1}{a_1 a_n}$

B. $\frac{n}{a_1 a_n}$

C. $\frac{n + 1}{a_1 a_n}$

D. $\frac{n - 1}{a_1 a_n}$

Answer: d



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25. Choose the most appropriate options.

The equation of a straight line passing through the point of intersection of $x - y + 1 = 0$ and $3x + y - 5 = 0$ and perpendicular to one of them, is

A. $x + y + 3 = 0$

B. $x - y - 3 = 0$

C. $x - 3y - 5 = 0$

D. $x - 3y + 5 = 0$

Answer: d



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26. Choose the most appropriate options.

The number of integral values of λ for which the equation

$$x^2 + y^2 - 2\lambda x + 2\lambda y + 14 = 0$$

represent a circle whose radius cannot exceed 6 is

A. 10

B. 11

C. 12

D. 9

Answer: b



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27. Choose the most appropriate option.

Let x_1 and x_2 be the roots of the equation

$$ax^2 + bx + c = 0 (ac \neq 0)$$

Find the value of $\frac{1}{x_1^2} + \frac{1}{x_2^2}$

A. $\frac{\sqrt{b^2 - 2ac}}{c}$

B. $\frac{c}{\sqrt{b^2 - 2ac}}$

C. $\frac{b^2 - 2ac}{c^2}$

D. $\frac{c^2}{b^2 - 2ac}$

Answer: c



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28. Choose the most appropriate options.

A line makes the same angle θ with each of the X and Z-axis. If the angle β which it makes with Y-axis is such that $\sin^2 \beta = 3 \sin^2 \theta$, then $\cos^2 \theta$ equals

A. $2/5$

B. $1/5$

C. $3/5$

D. $2/3$

Answer: c



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29. Choose the most appropriate options.

The mid-point of the chord $2x + y - 4 = 0$ of the parabola $y^2 = 4x$ is

A. $(5/2, -1)$

B. $(-1, 5/2)$

C. $(3/2, -1)$

D. None of these

Answer: a



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30. Choose the most appropriate options.

Gas is being pumped into a spherical balloon. Then, the rate at which the volume increases is $30\text{ft}^3 / \text{min}$ when the radius is 15ft, is

A. $\frac{1}{30\pi}$ ft/min

B. $\frac{1}{15\pi}$ ft/min

C. $\frac{1}{20}$ ft/min

D. $\frac{1}{25}$ ft/min

Answer: a



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31. Choose the most appropriate option.

If n is an integer, compute the value of the fraction

$$\frac{(1 + i)^n}{(1 - i)^{n-2}}$$

A. $2i$

B. $(2i)^n$

C. $2i^{n-1}$

D. $2i^{n-2}$

Answer: a



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32. Choose the most appropriate options.

If the tangent at $(1, 1)$ on $y^2 = x(2 - x)^2$ meets the curve again at P, then P is

A. $(4, 4)$

B. $(-1, 2)$

C. $(9/4, 3/8)$

D. None of these

Answer: c



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33. Choose the most appropriate options.

If $|a| < 1$ and $|b| < 1$ then the sum of series

$a(a + b) + a^2(a^2 + b^2) + a^3(a^3 + b^3) + \dots$ is

A. $\frac{a}{1 - a} + \frac{ab}{1 - ab}$

B. $\frac{a^2}{1 - a^2} + \frac{ab}{1 - ab}$

C. $\frac{b}{1 - b} + \frac{a}{1 - a}$

D. $\frac{b^2}{1 - b^2} + \frac{ab}{1 - ab}$

Answer: b



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34. Three points are chosen randomly and independently on a circle. What is the probability that all three pairwise distances between the points are less than the radius of the circle?

A. $1/36$

B. $1/24$

C. $1/18$

D. $1/12$

Answer: d



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35. Choose the most appropriate options.

If A is a square matrix such that

$A^2 = A$ and $B = I - A$ then,

$AB + BA + I - (I - A)^2$ is equal

A. A

B. $2A$

C. $-A$

D. $I - A$

Answer: a



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36. Choose the most appropriate option.

Calculate $\begin{vmatrix} x & y & x + y \\ y & x + y & x \\ x + y & x & y \end{vmatrix}$

A. $x^3 + y^3$

B. $x^3 + y^3 + 3x^2y + 3xy^2 + 1$

C. $-2(x^3 + y^3)$

D. $2(x^3 + y^3)$

Answer: c



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37. Choose the most appropriate options

Let $f(x) = (x^3 + 2)^{30}$. If $f^n(x)$ is a polynomial of degree 20 where $f^n(x)$ denotes the $n + h$ order derivative of $f(x)$ with respect to x then the value of n is

A. 60

B. 40

C. 70

D. 50

Answer: c



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38. Choose the most appropriate options.

The set of values of x satisfying the system of in equations $5x + 2 < 3x + 8$ and $\frac{x + 2}{x - 1} < 4$ is

A. $(-\infty, 1)$

B. $(2, 3)$

C. $(-\infty, 3)$

D. $(-\infty, 1) \cup (2, 3)$

Answer: d



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39. Choose the most appropriate option.

$\lim_{x \rightarrow a} \frac{\log_a x - 1}{x - a}$ is equal to

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

B. a

C. $\log_a e$

D. $\frac{1}{a} \log_a e$

Answer: d



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40. Choose the most appropriate options.

If $|z^2 - 1| = |z^2| + 1$, then z lies on a

A. circle

B. parabola

C. ellipse

D. None of these

Answer: d



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41. Choose the most appropriate options.

If $f(x) = [x \sin \pi x]$, then which of the following is incorrect?

- A. $f(x)$ is continuous at $x = 0$
- B. $f(x)$ is continuous in $(-1, 0)$
- C. $f(x)$ is differentiable at $x = 1$
- D. $f(x)$ is differentiable in $(-1, 1)$

Answer: c



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42. Choose the most appropriate option.

Find the distance from the point A (2, 3, - 1) to the given straight line.

$$x = 3t + 5$$

$$y = 2t$$

$$z = -2t - 25$$

A. 15

B. 17

C. 19

D. 21

Answer: d



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43. Choose the most appropriate options.

The degree of the differential equation

$$x = 1 + \frac{dy}{dx} + \frac{1}{2!} \left(\frac{dy}{dx} \right)^2 + \frac{1}{3!} \left(\frac{dy}{dx} \right)^3 + \dots$$

A. 3

B. 1

C. not dened

D. None of these

Answer: b

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44. Choose the most appropriate option.

On the sphere $(x - 1)^2 + (y + 2)^2 + (z - 3)^2 = 25$

find the point M_0 to the plane $3x - 4z + 19$

A. (7, -2, -2)

B. (2, -2, 7)

C. (-2, -2, 7)

D. (-2, 7, -2)

Answer: c



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45. Choose the most appropriate options.

$$\lim_{x \rightarrow 0} \frac{(1 - \cos 2x)(3 + \cos x)}{x \tan 4x} \text{ is equal to}$$

A. 4

B. 3

C. 2

D. $1/2$

Answer: c



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46. Choose the most appropriate options.

If $A(2,3)$ and $B(-2, 1)$ are two vertices of a triangle and third vertex moves on the line $2x + 3y = 9$, then the locus of the centroid of the new set of observations will be the triangle is

A. $2x + 3y = 1$

B. $2x + y = 3$

C. $2x - 3y = 1$

D. $x - y = 1$

Answer: a



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47. Choose the most appropriate option.

$$\lim_{x \rightarrow 0} \frac{\ln \cos 2x}{\sin 2x} \text{ is equal to}$$

A. 0

B. 1

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

D. ∞

Answer: a



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48. Choose the most appropriate options.

Let $f(x) = ax^3 + 5x^2 - bx + 1$. If $f(x)$ when divided by $2x + 1$ leaves 5 as remainder, and $f'(x)$ is divisible by $3x - 1$, then

A. $a = 26, b = 10$

B. $a = 24, b = 12$

C. $a = 26, b = 12$

D. None of these

Answer: c



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49. Choose the most appropriate options.

If the SD of a set of observations is 8 and each observation is divided by -2, then the SD of new set of observation will be

A. 4

B. -8

C. 8

D. 4

Answer: d



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50. Choose the most appropriate option.

$\lim_{x \rightarrow 1} \sin(x - 1)\tan\frac{\pi x}{x}$ is equal to

A. 0

B. $-\frac{1}{\pi}$

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

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

Answer: a



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