MATHS

BOOKS - MCGROW HILL EDUCATION MATHS (HINGLISH)

JEE (MAIN) 2020 QUESTION PAPER MATHEMATICS (8TH JAN - MORNING)

Questions

1. The system of equation

$3x + 4y + 5z = \mu$

$x + 2y + 3z = 1$

$4x + 4y + 4z = \delta$ is inconsistent, then (δ, μ) can be

A. (4,6)

B. (3,4)

C. (1,0)

D. (4,3)

Answer: D

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2. Let $y = y(x)$ be a solution the diFIGUREFIGUREerential equation,

$$\sqrt{1-x^2}\frac{dy}{dx} + \sqrt{1-y^2} = 0, |x| < 1.$$ IFIGURE

$y\left(\frac{1}{2}\right) = \frac{\sqrt{3}}{2}$, then $y\left(\frac{-1}{\sqrt{2}}\right)$ is equal to:

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

B. $-\sqrt{3}/2$

C. $1/\sqrt{2}$

D. $\sqrt{3}/2$

Answer: B

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3. If a, b and c are the gretaest values of $C(19, p), C(20, q)$ and $C(21, r)$ respectively then

A. $\frac{a}{11} = \frac{b}{22} = \frac{c}{42}$

B. $\frac{a}{10} = \frac{b}{11} = \frac{c}{42}$

C. $\frac{a}{11} = \frac{b}{22} = \frac{c}{21}$

D. $\frac{a}{10} = \frac{b}{11} = \frac{c}{21}$

Answer: A

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4. Which of the following is a tautology ?

A. $(P \wedge (P \rightarrow Q)) \rightarrow Q$

B. $P \wedge (P \vee Q)$

C. $Q \rightarrow (P \wedge (P \rightarrow Q))$

D. $P \vee (P \wedge Q)$

Answer: A

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5. Let $FIGURE: R \rightarrow R$ be such that FIGUREor all $x \in R$ $\left(2^{1+x} + 2^{1-x}\right)$, $FIGURE(x)$ and $\left(3^{x} + 3^{-x}\right)$ are in A.P., then the minimum value oFIGURE FIGURE(x) is:

A. 0

B. 4

C. 3

D. 2

Answer: C

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6. The locus of a point which divides the line segment joining the point (0, -1) and a point on the parabola,$x^2 = 4y$ internally in the ratio 1: 2, is:

A. $9x^2 - 12y = 8$

B. $4x^2 - 3y = 8$

C. $x^2 - 3y = 2$

D. $9x^2 - 3y = 2$

Answer: A

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7. For a > 0, let the curves $C_1 : y^2 = ax$ and $C_2 : x^2 = ay$ intersect at origin O and a point P. Let the line $x = b(0 < b < a)$ intersect the chord OP and the x-axis at points Q and R, respectively. If the line x = b bisects the area bounded by the curves, C_1 and C_2, and the area of $\triangle OQR = 1/2$, then 'a' satisfies the equation:

A. $x^6 - 12x^3 + 4 = 0$

B. $x^6 - 12x^3 - 4 = 0$

C. $x^6 + 6x^3 - 4 = 0$

D. $x^6 - 6x^2 + 4 = 0$

Answer: A

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8. $f(x) = \dfrac{8^{2x} - 8^{-2x}}{8^{2x} + 8^{-2x}}$ find the inverse of the function

A. $\dfrac{1}{4}\left(\log_g e\right)\log_e\left(\dfrac{1-x}{1+x}\right)$

B. $\dfrac{1}{4}\left(\log_g e\right)\log_e\left(\dfrac{1+x}{1-x}\right)$

C. $\dfrac{1}{4}\log_e\left(\dfrac{1-x}{1+x}\right)$

D. $\dfrac{1}{4}\log_e\left(\dfrac{1-x}{1+x}\right)$

Answer: B

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9. $\lim_{x \to 0} \left(\frac{3x^2 + 2}{7x^2 + 2} \right)^{\frac{1}{x^2}}$ is equal to

A. e

B. $1/e^2$

C. $1/e$

D. e^2

Answer: B

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10. Let $f(x) = \left\{ \left(\sin\left(\tan^{-1} x \right) + \sin\left(\cot^{-1} x \right) \right\}^2 - 1$, where $|x| > 1$ and $\frac{dy}{dx} = \frac{1}{2} \frac{d}{dx} \left(\sin^{-1} f(x) \right)$. If $y\left(\sqrt{3} \right) = \frac{\pi}{6}$ then $y\left(-\sqrt{3} \right)$

A. $\pi/3$

B. $2\pi/3$

C. $-\pi/6$

D. $5\pi/6$

Answer: C

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11. Roots of the equation $x^2 + bx + 45 = 0$, $b \in R$ lie on the curve `|z + 1| = 2sqrt(10) , where z is a complex number then

A. $b^2 + b = 12$

B. $b^2 - b = 42$

C. $b^2 - b = 30$

D. $b^2 + b = 72$

Answer: C

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12. Mean and standard deviations of 10 observations are 20 and 2 respectively. If p $(p \neq 0)$ is multiplied to each observation and then q $(q \neq 0)$ is subtracted then new mean and standard deviation becomes half of original value . Then find q

A. -20

B. -5

C. 10

D. -10

Answer: A

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13. Let $\int \frac{\cos x dx}{\left(\sin^3 x\left(1+\sin^6 x\right)\right)^{\frac{2}{3}}} = f(x), \left(1+\sin^6 x\right)^{\frac{1}{\lambda}} + C$ then find the value of $\lambda f\left(\frac{\pi}{3}\right)$

A. $-9/8$

B. $9/8$

C. 2

D. -2

Answer: D

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14. Let A and B be two independent events such that P(A) = 1/3 and P(B) = 1/6. Then, which of the following is TRUE?

A. $P(A)(A \cup B) = \frac{1}{4}$

B. $P(A \mid B') = \frac{1}{3}$

C. $P(A \mid B) = \frac{2}{3}$

D. $P(A' \mid B') = \frac{1}{3}$

Answer: B

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15. Let the volume of a parallelopiped whose coterminus edges are given by $u = I + j + \lambda k, v = I + j + 3k$ and w = 2i + j + k be 1 cu. unit. If θ be the angle between the edges u and w, then cos θ can be:

A. $\frac{7}{6\sqrt{6}}$

B. $\frac{5}{7}$

C. $\frac{7}{6\sqrt{3}}$

D. $\frac{5}{3\sqrt{3}}$

Answer: C

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16. Let two points be $A(1, -1)$ and $B(0, 2)$. If a point P(x', y') be such that the area of $\Delta PAB = 5$ sq. units and it lies on the line, $3x + y - 4\lambda = 0$, then a value of λ is:

A. 4

B. 1

C. -3

D. 3

Answer: D

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17. If the shortest distance between the lines $\frac{x-3}{3}=\frac{y-8}{-1}=\frac{z-3}{1}$ and $\frac{x+3}{-3}=\frac{y+7}{2}=\frac{z-6}{4}$ $is\lambda\sqrt{30}$ unit, then the value of λ is

A. $2\sqrt{30}$

B. $\frac{7}{2}\sqrt{30}$

C. 3

D. $3\sqrt{30}$

Answer: D

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18. Let the line $y = mx$ and the ellipse $2x^2 + y^2 = 1$ intersect at a point P in the first quadrant. If the normal to this ellipse at P meets the co - ordinate axes at $\left(-\frac{1}{3\sqrt{2}}, 0\right)$ and $(0, \beta)$, then β is equal to

A. $\frac{2}{\sqrt{3}}$

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

C. $\frac{2\sqrt{2}}{3}$

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

Answer: D

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19. If c is a point at which Roll's theorem holds for the function, $f(x) = \log_e\left(\frac{x^2+\alpha}{7x}\right)$ in the interval [3,4], where $\alpha \in R$ then $f''(c)$ is equal to:

A. $-\frac{1}{24}$

B. $-\frac{1}{12}$

C. $\frac{\sqrt{3}}{7}$

D. $\frac{1}{12}$

Answer: D

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20. Let $f(x) = x\cos^{-1}(\sin - |x|), x \in \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

A. $f'(0) = -\frac{\pi}{2}$

B. f' is decreasing in $\left(-\frac{\pi}{2}, 0\right)$ and increasing in $\left(0, \frac{\pi}{2}\right)$

C. f si not differentiable at x=0

D. f' is increasing in $\left(-\frac{\pi}{2}, 0\right)$ and decreasing in $\left(0, \frac{\pi}{2}\right)$

Answer: B

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21. An urn contains 5 read marbels,4 black marbels and 3 white marbles. Then the number oFIGURE wayes in which 4 marbles can be drawn so that most three them are red is _____

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22. If normal at P on the curve $y^2 - 3x^2 + y + 10 = 0$ passes through the point $\left(0, \frac{3}{2}\right)$,then slope of tangent at P is n. The

value of |n| is equal to

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23. The equation $2x^2 + (a - 10)x + \frac{33}{2} = 2a$ has real roots. Find least possible value of a.

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24. Find the sum, $\sum_{k=1}^{20} (1 + 2 + 3 + \ldots . + k)$

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25. The number of 3×3 matrices with entries from the set $\{-1, 0, 1\}$ such that the matrices symmetric nor skew symmetric is

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