MATHS

BOOKS - KVPY PREVIOUS YEAR

MOCK TEST 10

Exercise

1. Statement-1 : If a_1, a_2, a_3,..... a_n are positive real numbers , whose product is a fixed number c, then the minimum value of $a_1 + a_2 + \ldots. + a_{n-1} + 2a_n$ is $n(2C)^{\frac{1}{n}}$

Statement-2 :A.M. $\geq$ G.M.

A. $n(2c)^{1/n}$

B. $(n+1)c^{1/n}$

C. $2nc^{1/n}$

D. $(n+1)(2c)^{1/n}$

Answer:

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2. Let $S_n = \sum_{k=1}^{4n} (-1)^{\frac{k(k+1)}{2}} k^2$. Then S_n can take values

A. 1056

B. 1088

C. 1120

D. None of these

Answer:

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3. The triangle PQR is inscribed in the circle $x^2 + y^2 = 25$. If Q and R have co-ordinates(3,4) and(-4, 3) respectively, then $\angle QPR$ is equal to

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

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

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

D. $\frac{\pi}{6}$

Answer:

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4. The ellipse $E_1 : \frac{x^2}{9} + \frac{y^2}{4} = 1$ is inscribed in a rectangle R whose sides are parallel to the coordinate axes. Another ellipse E_2 passing through the point (0, 4) circumscribes the rectangle R. The eccentricity of the ellipse E_2 is $\frac{\sqrt{2}}{2}$ (b) $\frac{\sqrt{3}}{2}$ (c) $\frac{1}{2}$ (d) $\frac{3}{4}$

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

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

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

D. $\frac{3}{4}$

Answer:

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5. The smaller radius of the sphere passing through (1, 0,0),(0,1,0) and (0,0, 1)is:

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

B. $\sqrt{\frac{3}{8}}$

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

D. $\sqrt{\frac{5}{12}}$

Answer:

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6. The number of real values of the parameter k for which $(\log_{16} x)^2 - (\log)_{16} x + (\log)_{16} k = 0$ with real coefficients will have exactly one solution is 2 (b) 1 (c) 4 (d) none of these

A. 0

B. 2

C. 1

D. 4

Answer:

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7. Let S be the set of complex number a which satisfyndof $\log_{\frac{1}{3}}\left\{\log_{\frac{1}{2}}\left(|z|^2 + 4|z| + 3\right)\right\} < 0$, then S is (where $i = \sqrt{-1}$)

A. [-1,3]

B. $\{z : Re(z) \geq 1\}$

C. $\{z : i(z) \leq 2\}$

D. All ofthese

Answer:

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8. $(\lim)_{x \overrightarrow{0}} \left[\min \left(y^2 - 4y + 11\right) \frac{\sin x}{x} \right] (where[.]de \neg esthe$ greatest integer function is 5 (b) 6 (c) 7 (d) does not exist

A. 5

B. 6

C. 7

D. does not exist

Answer:

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9. If $P(x)$ is a polynomial of the least degree that has a maximum equal to 6 at $x = 1$, and a minimum equalto 2 at $x = 3$,then $\int_0^1 P(x)dx$ equals:

A. $\frac{17}{4}$

B. $\frac{13}{4}$

C. $\frac{19}{4}$

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

Answer:

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10. if $10! = 2^p 3^q 5^r 7^s$ then

A. p=7

B. q=4

C. r=3

D. s=2

Answer:

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11. Show that the height of the cylinder of maximum volume that can be inscribed in a sphere of radius R is $\frac{2R}{\sqrt{3}}$.

A. 2a/3

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

C. a/3

D. a/5

Answer:

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12. If $\left(\vec{a} \times \vec{b}\right)^2 + \left(\vec{a} . \vec{b}\right)^2$ = 676 and $\left|\vec{b}\right| = 2$, then $\left|\vec{a}\right|$ is equal to

A. 13

B. 26

C. 39

D. None of these

Answer:

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13. The equation $\dfrac{x^2}{1-r} - \dfrac{y^2}{1+r} = 1, r > 1,$ represents an ellipse (b) a hyperbola a circle (d) none of these

A. an ellipse

B. a hyperbola

C. a circle

D. None of these

Answer:

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14. The graph of the function, $\cos x \cos(x+2) - \cos^2(x+1)$ is

A. A straight line passing through (0,0)

B. A straight line passing through $\left(\frac{\pi}{2}, -\sin^2 1\right)$ and paralles to x-axis

C. A straight line passing through (0,$\sin^2$ 1)

D. not a straight line

Answer:

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15. If $f(x) = \cos\left\{\frac{\pi}{2}[x] - x^3\right\}, 1 < x < 2$, and [x] denotes the greatest integer less than or equal to x, then the value of

$f'\left(\sqrt[3]{\frac{\pi}{2}}\right)$, is

A. 0

B. 1

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

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

Answer:

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16. The number of real solutions of the equation $1+|e^x-1|=e^x(e^x-2)$ is :

A. 0

B. 1

C. 2

D. infinitely many

Answer:

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17. If $2x - y + 1 = 0$ is a tangent to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{16} = 1$ then which of the following CANNOT be sides of a right angled triangle? $a, 4, 2$ (b) $a, 4, 1$ $2a, 4, 1$ (d) $2a, 8, 1$

A. a,4,1

B. a,4, 2

C. 2a,8,1

D. 2a,4,1

Answer:

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18. If the equation $\frac{x^2}{3} - 4x + 13 = \sin\left(\frac{a}{x}\right)$ has a solution then a is equal to

A. $(2n+1)\frac{\pi}{2}$

B. $3(4n+1)\frac{\pi}{2}$

C. $3(1+4n)\pi$

D. None of these

Answer:

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19. If m be the slope of common tangent of $y = x^2 - x + 1$ and $y = x^2 - 3x + 1$. Then m is equal to

A. 2

B. -1

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

D. -2

Answer:

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20. If $S_n = ^n C_0 . ^n C_1 + ^n C_1 . ^n C_2 + \ldots . + ^n C_{n-1} . ^n C_n$ and if $\frac{S_{n+1}}{S_n} = \frac{15}{4}$, then the sum of all possible values of n is (A) 2 (B) 4 (C) 6 (D) 8

A. 3

B. 6

C. 7

D. 5

Answer:

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21. The value of integrals $\int_{-2}^{2} \max\{x+|x|, x-[x]\}dx$ where [.] represents the greatest integer function is

A. 4

B. 5

C. $\frac{7}{2}$

D. $\frac{9}{4}$

Answer:

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22. One hundred identical coins, each with probability 'p' of showing heads are tossed once. If $0 < p < 1$ and the probability of heads showing on 50 coins is equal to that of heads showing on 51 coins, then the value of p is

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

B. $\frac{49}{101}$

C. $\frac{50}{101}$

D. $\frac{51}{101}$

Answer:

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23. If ω is a complex nth root of unity, then $\sum_{r=1}^{n}(a+b)\omega^{r-1}$ is equal to $\frac{n(n+1)a}{2}$ b. $\frac{nb}{1+n}$ c. $\frac{na}{\omega-1}$ d. none of these

A. $\frac{n(n+1)a}{2\omega}$

B. $\frac{nb}{1-n}$

C. $\frac{na}{\omega-1}$

D. None of these

Answer:

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24. If $f(n+1)=\frac{1}{2}\left\{f(n)+\frac{9}{f(n)}\right\}, n \in N,$ and $f(n)>0f$ or $al\ln \in N,$ then find $(\lim)_{n \overrightarrow{\infty}} f(n)\cdot$

A. 3

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

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

D. not finite

Answer:

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25. An arch way is in the shape of a semi-ellipse, the road level being the major axis. If the breadth of the arch way is 30 feet and a man 6 feet tall just touches the top when 2 feet from the side, find the greatest height of the arch.

A. 10

B. 8

C. 6

D. 5

Answer:

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26. Let $f(x)$ be positive, continuous, and differentiable on the interval $(a, b) and (\lim)_{x \vec{a}^{+}} f(x) = 1$, $(\lim)_{x \vec{b}^{-}} f(x) = 3^{\frac{1}{4}} \dot{I} f f f'(x) \geq f^{3}(x) + \frac{1}{f(x)}$ then the greatest value of $b - a$ is $\frac{\pi}{48}$ (b) $\frac{\pi}{36}$ $\frac{\pi}{24}$ (d) $\frac{\pi}{12}$

A. 1

B. $3^{1/4}$

C. $\left(3^{1/4} - 1\right)\frac{\pi}{24}$

D. $\frac{\pi}{24}$

Answer:

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