8,April,2024 Shift-2 16-30

EE24BTECH11050 - Pothuri Rahul

16) If the line segment joining the points $(5,2)$ and $(2,a)$ subtends an angle $\frac{\pi}{4}$ at the origin, then the absolute value of the product of all possible values of a is :

a) 4 b) 2 c) 6 d) 8

17) If the shortest distance between the lines $\frac{x-\lambda}{2} = \frac{y-4}{3} = \frac{z-3}{4}$ and $\frac{x-2}{4} = \frac{y-4}{6} = \frac{z-7}{8}$ is $\frac{13}{\sqrt{29}}$, then the value of λ is :

a) -1 b) 1 c) $\frac{13}{25}$ d) $-\frac{13}{25}$

18) The number of ways five alphabets can be chosen from the alphabets of the word MATHEMATICS, where the chosen alphabets are not necessarily distinct, is equal to :

a) 175 b) 179 c) 181 d) 177

19) if $\alpha \neq a, \beta \neq b, \gamma \neq c$ and $\begin{vmatrix} \alpha & b & c \\ a & \beta & c \\ a & b & \gamma \end{vmatrix} = 0$, then $\frac{a}{\alpha-a} + \frac{b}{\beta-b} + \frac{\gamma}{\gamma-c}$ is equal to :

a) 2 b) 3 c) 0 d) 1

20) For $a, b > 0$, let $f(x) = \begin{cases} \frac{\tan((a+1)x)+b\tan x}{x} & , x < 0; \\ 3 & , x = 0; \\ \frac{\sqrt{ax+b^2x^2}-\sqrt{ax}}{b\sqrt{ax}\sqrt{x}} & , x > 0; \end{cases}$ be a continuous function at $x = 0$.

Then $\frac{b}{a}$ is equal to :

a) 5 b) 4 c) 6 d) 8

21) Let a ray of light passing through the point $(3,10)$ reflects on the line $2x+y = 6$ and then reflected ray passes through the point $(7,2)$. If the equation of the incident ray is $ax + by + 1 = 0$, then $a^2 + b^2 + 3ab$ is equal to ______.
22) Let $\alpha|x| = |y| e^{xy-\beta}, \alpha, \beta \in \mathbb{N}$ be the solution of the differential equation $xdy - ydx + xy(xdy + ydx) = 0$, $y(1) = 2$. Then $\alpha + \beta$ is equal to ______.
23) Let $a, b, c \in \mathbb{N}$ and $a < b < c$. Let the mean, the mean deviation about the mean and the variance of the 5 observations $9, 25, a, b, c$ be 18 , 4 and $\frac{136}{5}$, respectively. Then $2a + b - c$ is equal to ______.
24) Let S be the focus of the hyperbola $\frac{x^2}{3} - \frac{y^2}{5} = 1$, on the positive x-axis. Let C be the circle its centre at $\mathbf{A}\left(\sqrt{6}, \sqrt{5}\right)$ and passing through the points S. If O is the origin

and SAB is a diameter of C, then the square of the area of the triangle OSB is equal to ______.

25) Let A be the region enclosed by the parabola $y^2 = 2x$ and the line $x = 24$. Then the maximum area of the rectangle inscribed in the region A is: ______.

26) An arithmetic progression is written in the following way

2

5 8

11 14 17

20 23 26 29

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The sum of all the terms in 10th row is ______.

27) The number of distinct real roots of the equation $|x+1||x+3| - 4|x+2| + 5 = 0$ is ______.

28) If $\alpha = \lim_{x \to 0^+} \left(\frac{e^{\sqrt{\tan x}} - e^{\sqrt{x}}}{\sqrt{\tan x} - \sqrt{x}} \right)$ and $\beta = \lim_{x \to 0} (1 + \sin x)^{\frac{1}{2} \cot x}$ are the roots of the quadratic equation $ax^2 + bx - \sqrt{e} = 0$, then $12 \log_e (a + b)$ is equal to ______.

29) If $\int \frac{1}{\sqrt[5]{(x-1)^4 (x+3)^6}} dx = A \left(\frac{\alpha x - 1}{\beta x + 3} \right)^B + C$, where C is constant of integration, then the value of $\alpha + \beta + 20AB$ is ______.

30) let $\mathbf{P}(\alpha, \beta, \gamma)$ be the image of the point $\mathbf{Q}(\mathbf{1}, \mathbf{6}, \mathbf{4})$ in the line $\frac{x}{1} = \frac{y-1}{2} = \frac{z-2}{3}$. Then $2\alpha + \beta + \gamma$ is equal to ______.