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Shift-2

EE24BTECH11063 - Y.Harsha Vardhan Reddy

Integer Type

1) Let A be a 3×3 matrix and $\det(A) = 2$. If $n = \det(\underbrace{\text{adj}(\text{adj}(\ldots(\text{adj}(A))\ldots))}_{\text{2024 times}})$, then the remainder when n is divided by 9 is equal to

2) Let a, b, c be the length of three sides of a triangle satisfying the condition $\left(a^2+b^2\right)x^2 - 2b(a+c)x + \left(b^2+c^2\right) = 0$. If the set of all possible values of x is the interval (α,β), then $12\left(\alpha^2+\beta^2\right)$ is equal to

3) A line passes through $A(4,-6,-2)$ and $B(16,-2,4)$. The point $P(a,b,c)$ where a, b, c are non-negative integers, on the line AB lies at a distance of 21 units, from the point A. The distance between the points $P(a,b,c)$ and $Q(4,-12,3)$ is equal to

4) Let $y = y(x)$ be the solution of the differential equation $\sec^2 x\,dx + \left(e^{2y}\tan^2 x + \tan x\right)dy = 0$, $0 < x < \frac{\pi}{2}$, $y\left(\frac{\pi}{4}\right) = 0$.If $y\left(\frac{\pi}{6}\right) = \alpha$, then $e^{8\alpha}$ is equal to

5) $\left|\frac{120}{\pi^3}\int_0^{\pi}\frac{x^2\sin x\cos x}{\sin^4 x+\cos^4 x}\,dx\right|$ is equal to

6) Let $A = \{1,2,3,\cdots100\}$. Let R be a relation on A defined by $(x,y)\in R$ if and only if $2x = 3y$. Let R_1 be a symmetric relation on A such that $R \subset R_1$ and the number of elements in R_1 is n. Then, the minimum value of n is

7) Let the coefficient of x^r in the expression of
$(x+3)^{n-1} + (x+3)^{n-2}(x+2) + (x+3)^{n-3}(x+2)^2 + \cdots + (x+2)^{n-1}$ be α_i.
If $\sum_{i=1}^{n}\alpha_r = \beta^n - \gamma^n, \beta,\gamma\in\mathbb{N}$, then the value of $\beta^2+\gamma^2$ equals

8) Let $\vec{a} = 3\hat{i}+2\hat{j}+\hat{k}$, $\vec{b} = 2\hat{i}-\hat{j}+3\hat{k}$ and $\vec{c}$ be a vector such that $\left(\vec{a}+\vec{b}\right)\times\vec{c} = 2\left(\vec{a}\times\vec{b}\right)+24\hat{j}-6\hat{k}$ and $\left(\vec{a}-\vec{b}+\hat{i}\right)\cdot\vec{c} = -3$. Then $|\vec{c}|^2$ is equal to

9) If $\lim\limits_{x\to0}\frac{ax^2e^x - b\log_e(1+x) + cxe^{-x}}{x^2\sin x} = 1$, then $16\left(a^2+b^2+c^2\right)$ is equal to

10) Let $A(-2,-1)$, $B(1,0)$, $C(\alpha,\beta)$ and $D(\gamma,\delta)$ be the vertices of a parallelogram $ABCD$. If the point C lies on $2x-y = 5$ and the point D lies on $3x-2y = 6$, then the value of $|\alpha+\beta+\gamma+\delta|$ is equal to