MATHEMATICS

1. The line passing through the points A(1, −2, −3) and B(4, -5, -6) intersects the plane $z = 1$ at the point

A) $\left(\frac{7}{3}, -\frac{10}{3}, 1\right)$ B) $\left(-\frac{7}{3}, -\frac{10}{3}, 1\right)$ C) (−3, 2, 1) D) (−3, 6, 1)

2. A box contains 8 items of which 2 are defective. A person draws 3 items from the box. Determine the expected number of defective items.

A) 0.75 B) 0.3 C) 0.2 D) 0.1

3. If a = cos α + i sin α, b = cos β + i sin β, c = cos γ + i sin γ and a + b + c = 0, the value of $a^{-1} + b^{-1} + c^{-1}$ is

A) 1 B) 0 C) −1 D) 2

4. The value of λ for which the system of equations x+y-2z=0, 2x-3y+z=0. x-5y+4z= λ is consistent is

A) ι B) -1 C) 0 D) 2

5. Suppose $\vec{a}$ and $\vec{b}$ are vectors such that $\vec{a} \times \vec{b} = 2\hat{i} + \hat{j} - \hat{k}$ and $\vec{a} + \vec{b} = \hat{i} - \hat{j} + \hat{k}$. The least value of is $|\vec{a}|$

A) $\frac{1}{\sqrt{2}}$ B) 2 C) $\sqrt{2}$ D) $\sqrt{2} - 1$

6. A general solution to $y'' - \sqrt{5}y = 0$ is

A) $y = c_1 e^{\sqrt{5}t} + c_2 t$

B) $y = c_1 \cos\sqrt{5}t + c_2 \sin\sqrt{5}t$

C) $y = c_1 e^{\sqrt{5}t} + c_2 t e^{\sqrt{5}t}$

D) $y = c_1 e^{\sqrt[4]{5}t} + c_2 e^{-\sqrt[4]{5}t}$

7. In a binary communication channel, the probability that a transmitted zero is received as zero is 0.95 and the probability that a transmitted one is received as one is 0.90. If the probability that a zero is transmitted is 0.4, then the probability that a one was transmitted, given that a one was received is

A) $\frac{17}{28}$ B) $\frac{27}{37}$ C) $\frac{29}{37}$ D) $\frac{27}{28}$

8. If $(\vec{a}, \vec{b}, \vec{c})$ are three vectors such that if $\vec{a} \times \vec{b} = \vec{c}$ and $\vec{b} \times \vec{c} = \vec{a}$, then

A) If $\vec{a}, \vec{b}$ and $\vec{c}$ are pair-wise perpendicular

B) $|\vec{a}| = |\vec{b}| = |\vec{c})| = 1$

C) $|\vec{a}| = |\vec{b}| = |\vec{c})| \neq 1$

D) $|\vec{a}| \neq |\vec{b}| \neq |\vec{c})|$

9. If [×] denotes the greatest integer ≤×, then the value of the integral $\int_4^{10} \frac{[x^2]dx}{[x^2 - 28x + 196] + [x]^2}$ is

A) 0 B) 1 C) 3 D) 4

10. The proposition p ∧ (P∨ q)is

A) a tautology

B) a contradiction

C) logically equivalent to p ∧ q

D) logically equivalent to p ∨ q