Exam Questions of JEE Main 2019: Day 1

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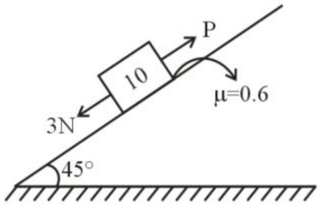
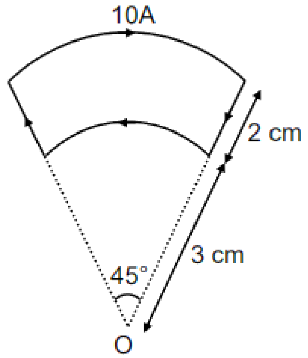
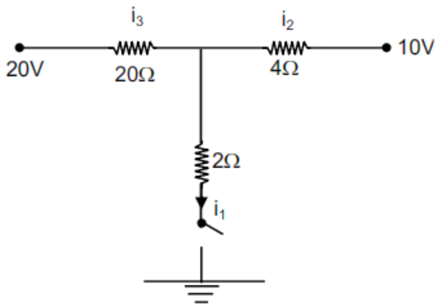
1. A block of mass 10 kg is kept on a rough inclined as shown in figure. The coefficient of friction between the block and the surface is 0.6. Two forces of magnitude 3N & P Newton are acting of the block as shown figure. If friction on the block is acting upwards then minimum value of P for which the block remains at rest is:



2. Find the magnetic field at point O is:



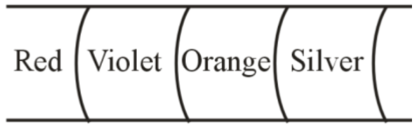
3. Value of i_1 (Ampere) when switch is closed is



4. The velocity of a particle at any instant is given by $\boxed{\vec{v} = k\left(y\hat{i} + x\hat{j}\right)}$. The equation of trajectory of particle is

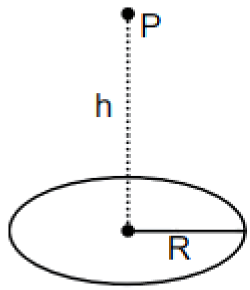
5. In a mixture 2 mole of He and 1 mole of Ar is present. Find $\dfrac{\left(V_{RMS}\right)_{He}}{\left(V_{RMS}\right)_{Ar}}$ at 300 k.

6. Find the resistance

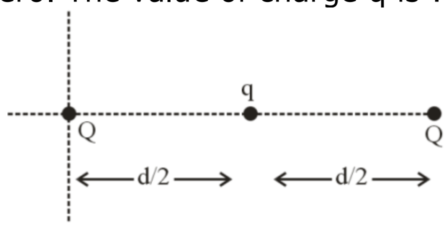


7. Torque is:
   A. Proportional to speed
   B. Inversely proportional to speed
   C. Proportional to square of speed
   D. Can not be related

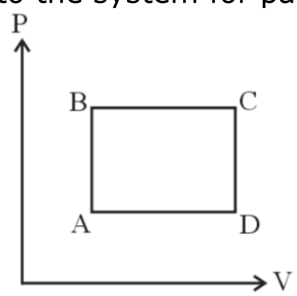
8. Charge Q is uniformly distributed over a ring of radius R. The height h, on the axis of the ring at which electric field is maximum



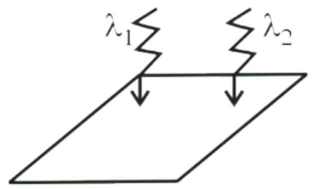
9. If net force on charge kept at O is zero. The value of charge q is :



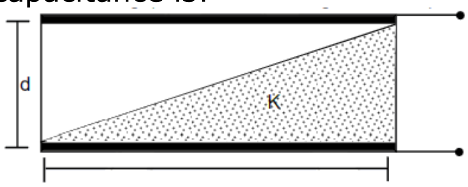
10. For path ABC, Heat given to the system is 60 J and work done by the system is 30 J. For path ADC, work done by the system is 10J. The heat given to the system for path ADC is:



11. Light of wavelengths λ_1 = 340 nm and λ_2 = 540 nm are incident on a metallic surface. If the ratio of the speed of the electrons ejected is 2. The work function of the metal is

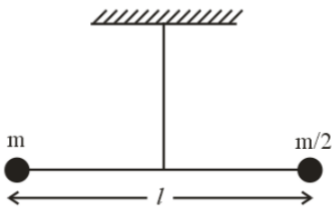


12. A capacitor is formed by two square metal-plates of edge a, separated by a distance d. Dielectric of dielectric constants K is filled in the gap as shown in the figure. The equivalent capacitance is:

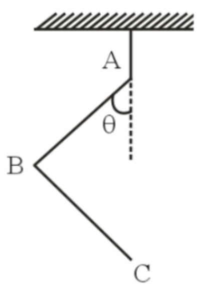


13. A block of mass 10 kg is kept on a rough inclined as shown in figure. The coefficient of friction between the block and the surface is 0.6. Two forces of magnitude 3N & P Newton are acting of the block as shown figure. If friction on the block is acting upwards then minimum value of P for which the block remains at rest is :

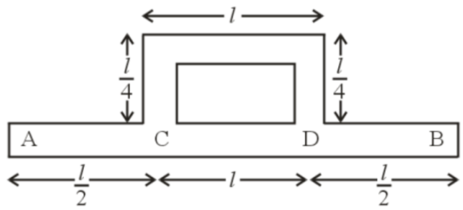
14. If a light rod is rotated by angle θ and torque equation is given by $\tau = k\theta$. If rod is rotated by angle θ_0 then the maximum tension in the rod is



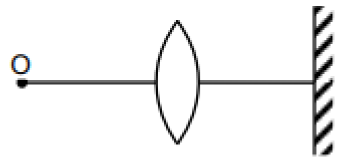
15. A uniform L shaped rod each of side A is held as shown in the figure. The angle θ such that rod remains stable will be.



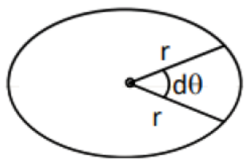
16. If temperature difference $T_1 - T_2$ is 120°C. The temperature difference between points A & B is:



17. Initially an object is kept at a distance of 10 cm from the convex lens and a sharp image is formed at 10 cm ahead of lens on the screen. Now a glass plate of μ = 1.5 cm and thickness 1.5 cm is placed between object and lens. The distance by which the screen be shifted to get sharp image on the screen will be



18. A planet of mass m having angular momentum L is revolving around the sun. The aerial velocity of the planet will be



19. Initially block of mass M is at rest on a frictionless floor and the spring is in relaxed condition A constant force is applied on the block as shown in figure. The maximum velocity of block is:

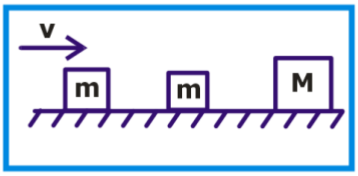
20. Two radioactive elements A & B have initial activity 10 curie & 20 curie respectively. If A has twice the no. of moles as that of B. The decay constant λ_A & λ_B can be

21. A conducting loop of resistance 10Ω and area 3.5×10^{-3} m^2 is placed in uniform and time varying magnetic field B = 0.4 sin (50 πt). The Charge passing through the loop in t = 0 to t = 10 ms is :

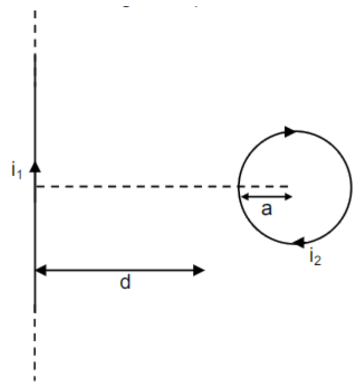
22. If current in a current carrying wire is 1.5A, number of free electrons per unit volume is 8×10^{28} m^3 and area

of cross section is 5 mm^2. Drift velocity of electrons will be

23. Three blocks m, m and M are kept on a frictionless floor as shown in figure. The left most block is given velocity v towards right. All the collisions between the blocks are perfectly inelastic. The loss in kinetic energy after all the collisions is 5/6th of initial kinetic energy. The ratio of M/m will be :



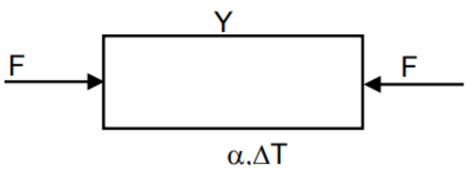
24. Given, d>>>a If force acting on loop is F then :



25. Two coherent light sources having intensity I_1 and I_2. If ratio of $\frac{I_{max}}{I_{min}}$ is 16 : 1. Find $\frac{I_1}{I_2}$?

26. If length of resistance wire is increased by 0.5 % keeping the volume constant then change in resistance will be :

27. A rod is acted by two equal forces as shown in the figure. The coefficient of thermal expansion of the rod is α and area of cross section is A. When the temperature the rod increased by Δ t. The length of the rod does not change. The young's modulus Y will be.



28. In a semiconductor mobility of electron, i.e. drift velocity per unit applied electric field is 1.6 (S.I unit). Density of electron is $10^{19}/m^3$. (Neglect holes concentration). Resistivity of semi conductor is :-

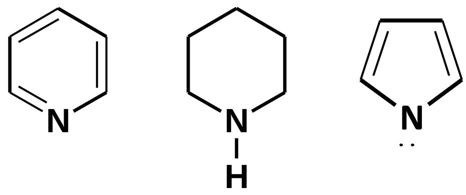
29. If value of electric field E = 6.3 ×10^{27} volt/m for a electromagnetic wave. The value of magnetic field B will be:

Chemistry

31. Alkali earth metal nitrate that doesn't crystalize with H_2O molecules

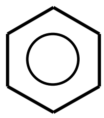
A. $Ba(NO_3)_2$ B. $Sr(NO_3)_2$ C. $Ca(NO_3)_2$ D. $Mg(NO_3)_2$

32. Find the correct order of basicity



a b c

A. a > b > c B. b > c > a C. b > a > c D. all of these

33.  + HCHO $\xrightarrow[AgCN]{HCl}$?

34. Reaction with DIBAL H with cyanide:

$CH_3-C\equiv N \xrightarrow[H_3O^+]{DIBAL\text{-}H}$

A. $CH_3-CH_2-NH_2$ B. $CH_3-C(=O)-NH_2$ C. CH_3-COOH D. CH_3-CHO

35. Given a mixture with 0.5 mole of gas A and x moles of gas B. Total pressure is 200 Pa at 1000 K temperature in a vessel of volume $10m^3$. The find x. j(R is universal gas constant)

A. $\frac{4-R}{2R}$ B. $\frac{4+R}{2R}$ C. $\frac{2-R}{2R}$ D. $\frac{2}{R}$

36. Number of possible isomers for square planer structure of

$\left[Pt(Cl)(NO_2)(NO_3)(SCN)\right]^{2-}$

A. 1 B. 2 C. 3 D. 4

37. According to MOT which of the following is true about Li^{2+} and Li^{2-} ?

A. Li^{2+} is more stable than Li^{2-}

B. Li^{2+} is less stable than Li^{2-}

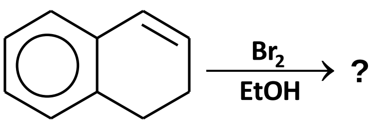
C. Li^{+} & Li^{2-} Both are unstable

D. Li^{+} & Li^{2-} Both are stable

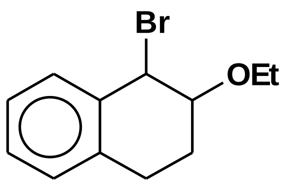
38. 92 gm sodium sulphate in 1kg what will be the molality of Na^{+} ion?

39. Which of the following metal is unsuitable for drinking water

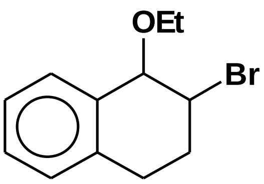
A. Fe B. Mn C. Zn D. Cu

40. 

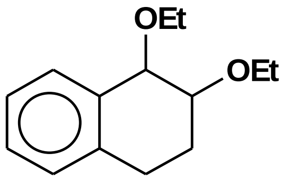
A.



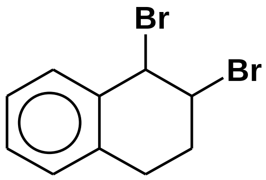
B.



C.



D.



41. Copper and iron together present in which are

A. Dolomite B. Malachite are C. Azurite D. Copper pyrite

42. Which is most acidic in nature?

A. $CH(CN)_3$ B. $CHBr_3$ C. $CHCl_3$ D. CHI_3

43. Acidic character order in.

A. $O_2N-CH_2\,COOH$

B. $CN-CH_2-COOH$

C. $F-CH_3-COOH$

D. $Cl-CH_3-COOH$

44. $\left[Cr(H_2O)_6\right]Cl_3 \rightarrow$ Violet colour

$\left[Cr(NH_3)_6\right]Cl_3 \rightarrow$ Yellow Colour

A. Incorrect statement both are paramagnetic

B. Δ_0 same

C. Δ_0 is calculated by colour

45. Maximum spin only magnetic moment for transition metal complex may be

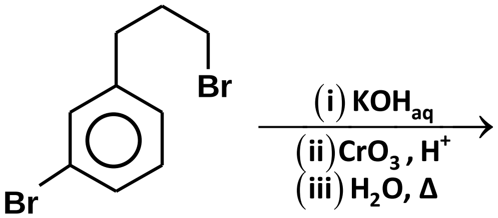
A. 5.92 BM B. 6.92 BM C. 4.89 BM D. 3.87 BM

46. If zinc rod is kept in copper sulphate solution. Then after some time, the solution becomes

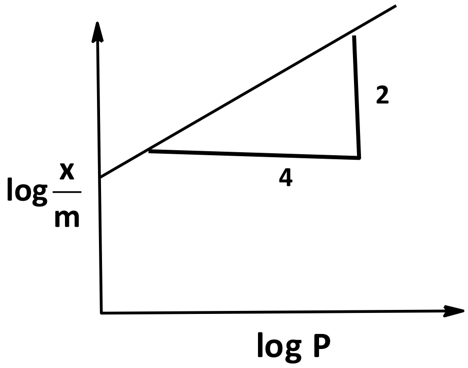
A. Colourless B. Red C. Blue D. Can't be said

47. A solution of 0.1 M H_2SO_4 and 0.2 NH_4OH are mixed. Find pH of solution. (pKb = 4.74)

48. Which of the following has minimum lattice energy?
A. Mg B. Sr C. Ba D. Ca

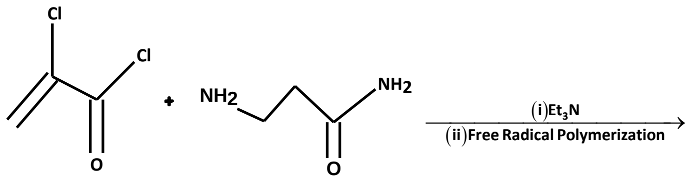
49. 

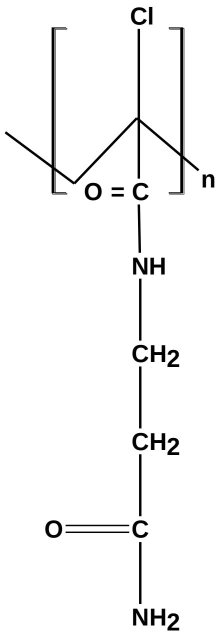
50. Piezoelectric element are
A. Quartz B. Non of these C. Mica D. Amorphous silica

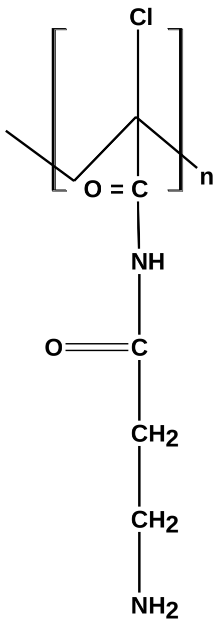
51. 

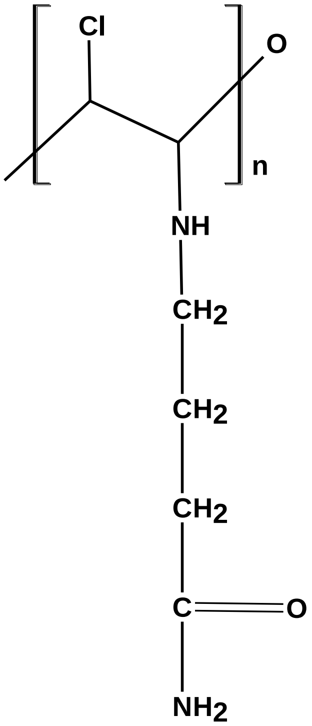
$\frac{x}{m}$ is proportional to
A. P B. P^2 C. $P^{\frac{1}{4}}$ D. $P^{\frac{1}{2}}$

52. Match the following drugs with correct functional group test
(A) Chloroxylenol (P) Carbyl amine
(B) Penicillin (Q) Baeyer's Reagent
(C) Sulpha pyridine (R) $FeCl_3$ test
(D) Norethindrone (S) Sodium hydrogen sulphate
A. A → R, B → P, C → S, D → Q
B. A → S, B → R, C → P, D → Q
C. A→ R, B→ S, C → P, D → Q
D. A → Q, B → R, C → P, D → S

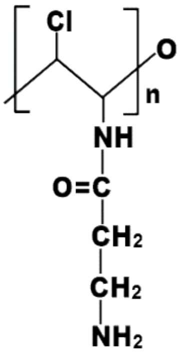
53. 

A. 

B. 



C.



D.

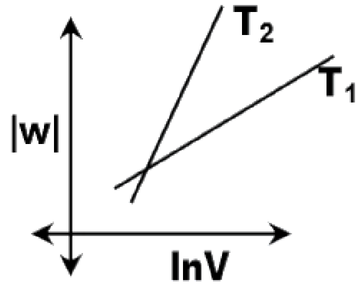
54. Which of the following is not correct about Henry's law
(1) On increasing temperature value of K_H increases
(2) Value of K_H increases solubility of gas increases
(3) Value of K_H for two different gases at same temperature is not same
(4) None of these

55. 2A + B → product

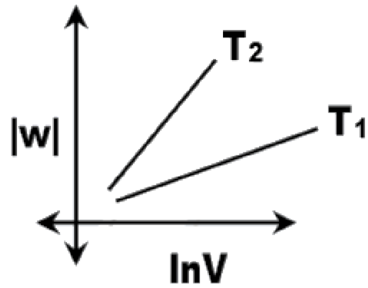
[A]	[B]	rate (M min^{-1})
0.1	0.2	6.93×10^{-3}
0.1	0.25	6.93×10^{-3}
0.2	0.3	1.386×10^{-2}

Time when concertation of A becomes half
A. 1
B. 10
C. 100
D. 5

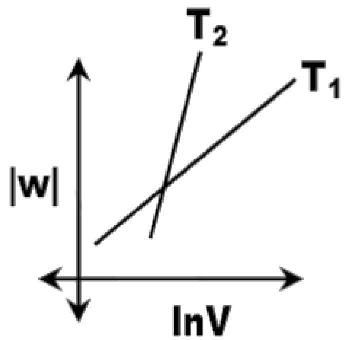
56. Reversible isothermal expansion of gas for two temperature T_1 & T_2 ($T_2 > T_1$). Graph versus |w| and ln V



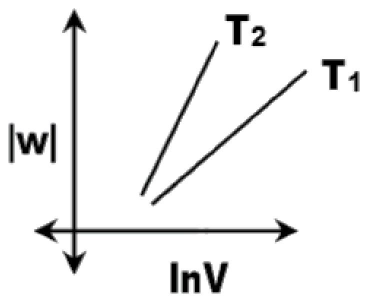
A.



B.



C.



D.

57. Which of the following properties is/are true for a silicone polymer
(A) Thermally resistant and have low dielectric constant
(B) Resistant towards oxidation and used in grease
(C) Biocompatible
(D) Hydrophobic in nature

58. 0.05 F charge is passed through a lead storage battery. In the anodic reaction, what is the amount of $PbSO_4$ precipitated (molar mass of $PbS0_4$ is 303 g/mol)

A. 30.3 g B. 15.15 g C. 7.6 g D. 60.6g

59. In hydrogen emission spectrum electron transition takes place from n = 8 to n = n_f. If we plot the graph $\bar{\nu}$ **vs** $\frac{1}{n_f^2}$. Which of the following statement is corrct.

A. Slope = - R_H B. Slope = R_H
C. Intercept = R_H D. Graph is non linear

60. Aluminium exist in +3 state where as thallium exist in both +1 & +3 oxidation state. Reason for this is

A. inert pair effect
B. Lanthanoid contraction
C. Diagonal relationship
D. none of these

Maths

61. If $\vec{a} = \hat{i} - \hat{j}$, $\vec{b} = \hat{i} + \hat{j} + \hat{k}$ and $\vec{c}$ are three vectors, $\vec{a} \times \vec{c} + \vec{b} = 0$ and $\vec{a}.\vec{c} = 4$, find $|\vec{c}|^2$.

62. 5 students in school have height 150 and variance = 18. One new student comes into the class whose height is 156 cm. What will the new variance?

63. $\int_0^{\pi} |\cos x|^3 \, dx$

64. If α and β are the roots of the quadratic equation $x^2 + 2x + 2 = 0$. Then $\alpha^{15} + \beta^{15} =$

65. There are 5 girls and 7 boys. Find the number of ways in which 2 girls and 3 boys can be chosen in a group of 5 students, if two boys, reject to sit together.

66. Find the equation of common tangent to the curves $y^2 = 4x$ and $x^2 + y^2 - 6x = 0$.

67. If the matrix A = $\begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$, find A^{-50} if $\theta = \frac{\pi}{12}$.

68. Two cords are chosen from a deck of cards with replacement and X is the random variable for the number of aces, then what is the value of P(X = 1) + P(X = 2) = ________

69. The vertex and focus of the parabola $y^2 = 4ax$ is (2, 0) and (4, 0) respectively, then which of the following point will not satisfy the equation of parabola.

70. If {.} denotes fractional part of the function, $\left\{\frac{2^{403}}{15}\right\} = \frac{k}{15}$.

71. What is the maximum volume of a right circular cone whose slant height is 3 cm.

72. If $(p \oplus q) \wedge (\sim p \square\, q)$ is equal to p ^ q then one value of ordered pair $(\oplus, \square)$ is

A. V, Λ　　B. Λ, V

C. V, V　　D. V, Λ

73. If a, b, c are in G.P, then a + b + c = bx, then x cannot be

74. If px + qy + r = 0 is the system of lines and 3p + 2q + 4r = 0 which of the following are true?

75. $$\int x \sqrt{\frac{2\sin(x^2-1) - \sin\left[2(x^2-1)\right]}{2\sin(x^2-1) + \sin\left[2(x^2-1)\right]}}\, dx =$$

76. $$\int_{\pi/2}^{\pi} \frac{\sin\left(\frac{3x}{2}\right)}{\sin\left(\frac{x}{2}\right)}\, dx =$$

A. $\frac{\pi}{2} + 2$　　B. $\frac{\pi}{2} - 2$

C. $1 + \frac{\pi}{2}$　　D. $\pi\left(1 + \frac{1}{\sqrt{2}}\right)$

77. Find x it $\cos\left(\frac{2x}{3}\right) + \cos\left(\frac{3}{4x}\right) = \frac{\pi}{2}$.

78. Given $\frac{dx}{dt} = ky$ and $\frac{dy}{dt} = kx$. Find equation of the curve.

79. If the hyperbola $\frac{x^2}{\cos^2\theta} - \frac{y^2}{\sin^2\theta} = 1$ has on eccentricity, e > z, find the range of length of latus rectum.

80. The equation of parabola is $y = x^2 - 1$. A tangent at (2, 3) is drawn to this

parabola. Find the area bounded by the y-axis, the tangent and the parabola.

81. If, a, b, c are real numbers and a^2, b^2, c^2 are in A.P., then which of the following combinations are in A.P.

A. $\frac{1}{(b-c)}, \frac{1}{(a-b)}, \frac{1}{(c-a)}$

B. $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$

C. $\frac{1}{(a+2b)}, \frac{1}{(b+2c)}, \frac{1}{(c+2a)}$

D. None

82. Solve $x\frac{dy}{dx} + 2y = x^2$.

83. $f(x) = \begin{cases} 5 & , \quad x \le 1 \\ a+bx & ; \quad 1 < x < 3 \\ b+5x & ; \quad 3 \le x < 5 \\ 30 & ; \quad x \ge 5 \end{cases}$

A. f(x) is discontinuous $\forall a \in R, b \in R$

B. f(x) is continuous if a = 0 & b = 5

C. f(x) is continuous if a = 5, b = 0

D. f(x) is continuous if a = −5, b = 10

84. $\lim\limits_{y \to 0} \frac{\sqrt{1+\sqrt{1+y^4}} - \sqrt{2}}{y^4} =$

A. $\frac{1}{4\sqrt{2}}$

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

C. $\frac{1}{2\sqrt{2}(1+\sqrt{2})}$

D. does not exit

85. Find sum of all possible values of θ in the interval $\left(-\frac{\pi}{2}, \pi\right)$ for which $\frac{3+i2\sin\theta}{1-i2\sin\theta}$ is purely imaginary

A. π / 3

B. π

C. 2π/3

D. π/2

86. Consider the system of equations x + y + z = 1, 2x + 3y + 2z = 1, 2x + 3y + $(a^2 - 1)$ z = a + 1 then

A. system has a unique solution for |a| = $\sqrt{3}$

B. system is inconsistence for |a| = $\sqrt{3}$

C. system is inconsistence for a = 4

D. system is inconsistence for a = 3

87. The value of $3(\cos\theta - \sin\theta)^4 + 6(\sin\theta + \cos\theta)^2 + 4\sin^6\theta$ is where $\theta \in \left(\frac{\pi}{4}, \frac{\pi}{2}\right)$

A. $13 - 4\cos^4\theta$

B. $13 - 4\cos^6\theta$

C. $13 - 4\cos^6\theta + 2\sin^4\theta\cos^2\theta$

D. $13 - 4\cos^4\theta + 2\sin^4\theta\cos^2\theta$

88. 3 circles of radii a, b, c (a < b < c) touch each other externally and have x-axis as a common tangent then

A a, b, c are in A.P.

B. $\frac{1}{\sqrt{b}} = \frac{1}{\sqrt{a}} + \frac{1}{\sqrt{c}}$

C. $\sqrt{a}, \sqrt{b}, \sqrt{c}$ are in A.P.

D. $\frac{1}{\sqrt{c}} + \frac{1}{\sqrt{b}} = \frac{1}{\sqrt{a}}$

89. If $f(x) = \frac{1}{x}, f_2(x) = 1-x, f_3(x) = \frac{1}{1-x}$ then find J(x) such that f_2 o J o f_1 (x) = f_3(x)

A. f_1 (x)

B. $\frac{1}{x}f_3(x)$

C. f_3 (x)

D. f_2 (x)

90. Find the equation of line through (−4, 1, 3) & parallel to the plane x + y + z = 3 while the line intersects another line whose equation is x + y − z = x + 2y − 3z + 5

A. $\frac{x+4}{-3} = \frac{y-1}{-2} = \frac{z-3}{1}$

B. $\frac{x+4}{1}=\frac{y-1}{2}=\frac{z-3}{-3}$

C. $\frac{x+4}{-3}=\frac{y-1}{2}=\frac{z-3}{1}$

D. $\frac{x+4}{-1}=\frac{y-1}{2}=\frac{z-3}{-3}$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