Sri Chaitanya IIT Academy.,India.

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A right Choice for the Real Aspirant

ICON Central Office - Madhapur - Hyderabad

SEC: Sr.Super60_NUCLEUS&STERLING_BT JEE-MAIN Date: 09-01-2023

Time: 09.00Am to 12.00Pm GTM-04 Max. Marks: 300

KEY SHEET

PHYSICS

1)	**1**	2)	**2**	3)	**2**	4)	**1**	5)	**2**
6)	**3**	7)	**1**	8)	**4**	9)	**4**	10)	**1**
11)	**4**	12)	**3**	13)	**2**	14)	**4**	15)	**2**
16)	**4**	17)	**1**	18)	**1**	19)	**4**	20)	**3**
21)	**3**	22)	**2**	23)	**6**	24)	**28**	25)	**3**
26)	**30**	27)	**72**	28)	**1**	29)	**9**	30)	**6**

CHEMISTRY

31)	**3**	32)	**3**	33)	**2**	34)	**1**	35)	**1**
36)	**3**	37)	**4**	38)	**2**	39)	**4**	40)	**4**
41)	**2**	42)	**1**	43)	**4**	44)	**1**	45)	**3**
46)	**1**	47)	**4**	48)	**2**	49)	**1**	50)	**3**
51)	**5**	52)	**2**	53)	**1**	54)	**10**	55)	**23**
56)	**2**	57)	**1**	58)	**500**	59)	**2**	60)	**10**

MATHEMATICS

61)	**3**	62)	**2**	63)	**4**	64)	**3**	65)	**3**
66)	**2**	67)	**3**	68)	**3**	69)	**1**	70)	**1**
71)	**3**	72)	**4**	73)	**3**	74)	**1**	75)	**2**
76)	**2**	77)	**4**	78)	**2**	79)	**3**	80)	**2**
81)	**6**	82)	**8**	83)	**2**	84)	**5**	85)	**9**
86)	**4**	87)	**1**	88)	**2**	89)	**3**	90)	**7**

SOLUTIONS

PHYSICS

1. As λ increases saturation current also increases

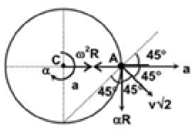
2. Let x be the depth of point P from surface

App. depth of point P from surface $=\frac{x}{\mu}$

App. depth of image of P from surface $=\frac{x+2h}{\mu}$

So, separation between two $=\frac{x+2h}{\mu}-\frac{x}{\mu}\Rightarrow\frac{2h}{\mu}$

3. Velocity of point 'A' $V_A=\sqrt{V^2+\omega^2R^2}=v\sqrt{2}$ Normal acceleration of point A,



$a_A(n)=\omega^2R\cos45°+\alpha R\cos45°-a\cos45°$, $\quad a_{A(n)}=\frac{\omega^2R}{\sqrt{2}}=\frac{V^2}{\sqrt{2}R}$

$\therefore$ radius of curvature of trajectory of point 'A' relative to the ground is

$$r=\frac{(V_A)^2}{a_{A(n)}}=\frac{(V\sqrt{2})^2}{\frac{V^2}{\sqrt{2}R}}=2\sqrt{2}R$$

4. : From ohm's law electric field α current density

5. $\Delta A=\pi\ell b(2\alpha)T$

6. Conceptual

7. Conceptual

8.

SOL:

$V^2=\omega^2\left(a^2-x^2\right)$

$\Rightarrow V_1^2=\omega^2\left(a^2-y_1^2\right)$.....................(1)

$\Rightarrow V_2^2=\omega^2\left(a^2-y_2^2\right)$....................(2)

From (1) and (2), we get

$$T=2\pi\sqrt{\frac{y_1^2-y_2^2}{V_2^2-V_1^2}}$$

9. Conceptual

10. Conceptual

11. Conceptual

12. $\tan\theta_1 = \dfrac{\tan\theta}{\cos\alpha}$

and $\tan\theta_2 = \dfrac{\tan\theta}{\cos\left(90^0 - \alpha\right)} = \dfrac{\tan\theta}{\sin\alpha}$

$\Rightarrow \cos\alpha = \dfrac{\tan\theta}{\tan\theta_1}$................$(1)$

and $\sin\alpha = \dfrac{\tan\theta}{\tan\theta_2}$................$(2)$

Dividing (2) by (1), we have

$\tan\alpha = \dfrac{\tan\theta_1}{\tan\theta_2}$

13. Conceptual

14. $I_c = 100 \times 0.04\,mA = 4\,mA$

$V_c = 20 - 12 = 8V \Rightarrow R_c = \dfrac{8}{4\times10^{-3}} = 2000\Omega$

15. Conceptual

16. Conceptual

17. The density of lead is $1.13\times10^4 kg/m^3$, so we should expect our calculated value to be close to this value. The density of water is $1.00\times10^3 kg/m^3$, so we see that lead is about 11 times denser than water, which agrees with our experience that lead sinks. Density is defined as $\rho = m/V$. We must convert to SI units in the calculation.

$$\rho = \left(\frac{23.94g}{2.10cm^3}\right)\left(\frac{1kg}{1000\,g}\right)\left(\frac{100\,cm}{1m}\right)^3$$

$$= \left(\frac{23.94g}{2.10\,cm^3}\right)\left(\frac{1kg}{1000\,g}\right)\left(\frac{1000\,000\,cm^3}{1m^3}\right) = 1.14\times10^4 kg/m^3$$

18. I. Induced emf in the rod $\varepsilon = BIv$

:

Current in the circuit $I = \dfrac{\varepsilon}{R}e^{-t/RC} = \dfrac{BIv}{R}e^{-t/RC}$

Since the net force on the rod should be zero, the external force will be equal in magnitude but opposite to the magnetic force.

$\Rightarrow F = IIB = \dfrac{B^2I^2V}{R}e^{-t/RC}$

19. Conceptual

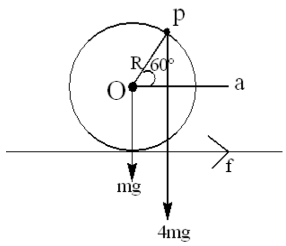
20. SOL: (i), (ii) are true but (iii) is false, as we know that viscosity in gaseous is about 100 times less than viscosity in liquids.

21. $R = \dfrac{V^2}{gv_0}.V = \dfrac{V^3}{gV_0}; R\alpha V^3$

22. Capacitors are in series therefore $\frac{C_1}{C_2}=\frac{V_2}{V_1}=\frac{2}{3}$

23. Conceptual

24.
$$\tau_0 = I_0\alpha \Rightarrow \frac{2}{5}mR\alpha + f = 2mg$$
$$\& f = ma = maR$$
$$\Rightarrow f = \frac{10}{7}mg \Rightarrow \frac{10}{7}mg \le \mu N \Rightarrow \frac{10}{7}mg \le \mu(5mg), \mu \ge \left(\frac{2}{7}\right)$$



25. SOL: Required kinetic energy $=[m(N)+m(n)-m(H)-m(C)]\times 931\text{MeV}$
$$= 2.99\,\text{MeV}$$

26. SOL: When the extension is maximum, their velocities are equal. From the law of conservation of Momentum,
$$P_f = p_i \Rightarrow (6)\upsilon + (3)\upsilon = 6(2) + 3(-1)$$
$$\upsilon = 1\,ms^{-1}$$
This energy is also conserved
$$E_f = E_i \Rightarrow \frac{1}{2}(6)(1)^2 + \frac{1}{2}(3)(1)^2 + \frac{1}{2}Kx_m^2 = \frac{1}{2}(6)(2)^2 + \frac{1}{2}(3)(1)^2$$
$$3 + 1.5 + \frac{1}{2}(200)x_m^2 = 12 + 1.5$$
$$100x_m^2 = 9 \Rightarrow x_m^2 = 0.09 \Rightarrow x_m = 0.3m = 30m$$

27. $A > 2\theta_c$

28.
$$E_2 = \frac{E_1}{R_1 + R_{AB}} \times \frac{31.25 \times 10}{50}$$

29. If initial velocities are: $u_1 = \sqrt{2gh}(\downarrow), u_2 = \sqrt{2gh}(\uparrow)$

Then final velocities: $v_1 = 3\sqrt{2gh}, v_2\sqrt{2gh}$

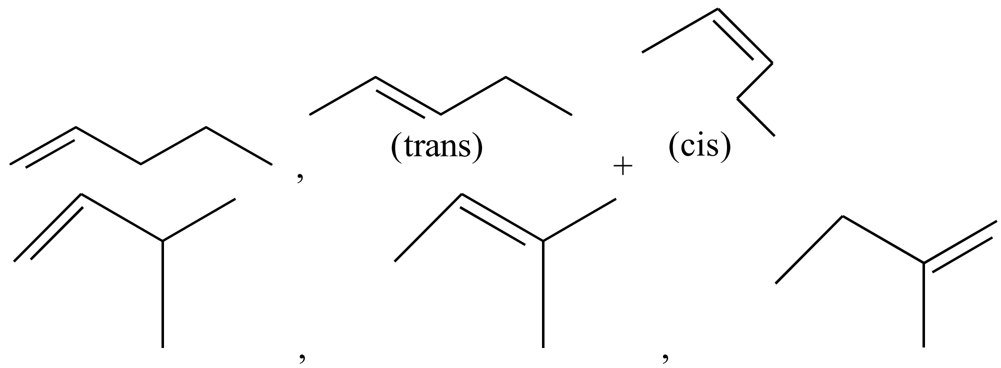
By using conservation of momentum and equation of e & m <<M.

30.
$$\beta = 10\log\frac{I}{I_0} \qquad 3 = \log\frac{I}{10^{-12}} \qquad \Rightarrow I = 10^{-9}\,W/m^2$$

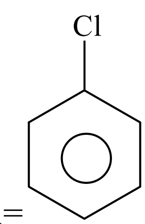
$$\text{Now, } I = \frac{(\Delta P_0)^2 V}{2B} = \frac{(BAK)^2 V}{2B} = \frac{B\omega^2 A^2}{2V} = \frac{BA^2 4\pi^2 f^2}{2V}$$
$$A = \sqrt{\frac{IV}{B2\pi^2 f^2}} = \sqrt{\frac{I}{\rho v 2\pi^2 f^2}} = 5.55\,\overset{0}{A}$$

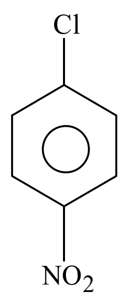
CHEMISTRY

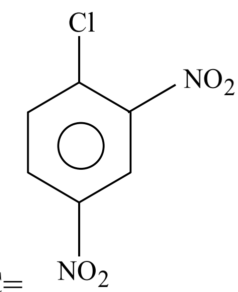
31. Refer NCERT- P -block Group – 15, pg-179,180 and solutions, pg- 49
32. Refer f - block
33. Conceptual
34. Conceptual
35. NCERT-Hydrogen
36. C_5H_{10}

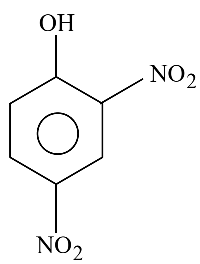


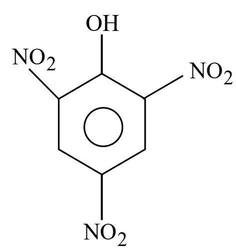
37. A is $CH_2=CHCl$, B is $HC\equiv CH$
$HC\equiv CH$ has active hydrogen so CH_4 is liberated
38.

A= 

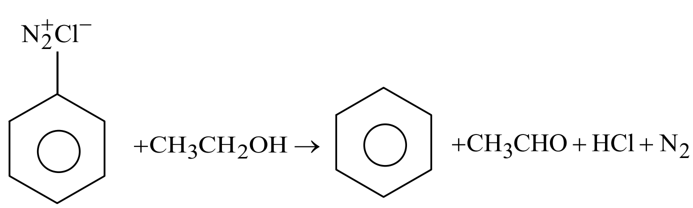
B= 

C= 

D = 

E = 

39. Solution :



40. Carboxylate ion is more stable than phenoxide ion
41. $CH_3-Cl\xrightarrow{\text{Ethanolic NaCN}}CH_3CN\xrightarrow{H_2/Ni}CH_3-CH_2-NH_2$
compound 'F' is CH_3-NH_2
42. Refer NCERT page no – 413,414,415 12^{th} class part II
43. NCERT, Histamine is used for secretion of pepsin and HCl in stomach

44.

ion/molecule	NO.of $\bar{e}$ in BMO	No of $\bar{e}$ in ABMO	Bond order
O_2^+	10	5	2.5
O_2	10	6	2
O_2^-	10	7	1.5
O_2^{2-}	10	8	1

45. textbook pg no . 285,290

46. $1.\, Li^+ = (76\text{ pm}),\, Mg^{+2} = (72\text{ pm})\,(\text{NCERT pg} - 304\text{ s} - \text{block})$

$2.\, Cu^{+2} < Zn^{+2} \qquad 3.\, Na^+ < F^-\,(\text{Iso electronic})$

$4.\, Ce^{+3} > Pr^{+3}\,(\text{Lathanoide contraction})$

47. Hybridisation of Al is sp^3d^2, shape-Octahedral

b)Boran is unable to from BF_6^{3-}

c)preparation of diborane(ncert)

$[SiF_6]^{2-}$ is know(ncert)

48. ncert

49. NCERT

50.

$$\%\text{ of chlorine} = \frac{\text{Weight of AgCl} \times 35.5 \times 100}{\text{Weight of substance} \times 143.5}$$

$$= \frac{0.7175 \times 35.5 \times 100}{0.3905 \times 143.5} = \frac{5}{1000} \times \frac{1000}{11} \times 100 = 45.45$$

51. $\Rightarrow$ Radial nodes are obtained for

$$\Rightarrow \left(1 - \frac{13r}{36a_0} + \frac{r^2}{36a_0^2}\right) = 0 \Rightarrow \left(\frac{r}{4a_0} - 1\right)\left(\frac{r}{9a_0} - 1\right) = 0$$

$\Rightarrow r = 4a_0$ and $r = 9a_0$, Distance between nodes $\Delta r = 5a_0$

52. sol: $\boxed{2}$ $K_p = K_c(RT)^{\Delta ng} \Rightarrow K_c = \dfrac{47.9}{(0.083 \times 288)^1} \approx 2$

53.

$$\frac{Po - Ps}{Ps} = i\left(\frac{n_{solute}}{n_{solvent}}\right) \Rightarrow \frac{650 - 640}{640} = 1 \times \frac{0.25 \times 78}{m \times 39} \Rightarrow M(\text{solute}) = 32\,\text{gm}$$

$$\text{Now, } \Delta Tf = K_f xm = 5.12 \times \frac{0.25 \times 1000}{32 \times 39} \approx 1$$

54. Sol: $\boxed{x = 10}$, $E^\circ cell = E^o_{cathode} - E^\circ anode$

$(E^\circ anode)_R = E^\circ_{In} 3 + / In^{+2}, \qquad E^\circ_{In} 3 / In^{+2} = 2E^\circ In^{+3} / In^{+1} - E^\circ_{In}{}^{2+} / In^{+1}$

$E^o_{In} + 3 / In + 2 = 2(-0.42) - (-0.4) \quad = -0.44$

$\Rightarrow E^\circ cell = 0.15 - (-0.44) = 0.59$

So, $-RT\ln keq = -nfE°cell \Rightarrow \log keq = \frac{nf}{2-303RT}E°cell$

$\Rightarrow \log keq = \frac{0.59}{0.059} \Rightarrow keq = 10^{10}$

55. Sol: $\boxed{Y = 23}$

Unit of k represent first order kinetics $2N_2O_5 \rightarrow 2N_2O_4 + O_2$

t=o	1	0	0
t=t	1-p	p	p/2

$\Rightarrow 1-p+p+p/2 = 1.45 \Rightarrow P = 0.9$

$t = \frac{2.303}{2K}\times\log\frac{1}{1-P} \Rightarrow t = \frac{2.303}{2\times5\times10^{-4}}\log\left[\frac{1}{0.1}\right]$

$\Rightarrow t = 2.303\times10^3 \sec \Rightarrow t \approx 23\times10^2 \sec$

<u>Note:</u> Here '2K' should be considered instead of K because $\frac{-1}{2}\frac{d[N_2O_5]}{dt} = K$.

56. Sol: $\boxed{2}$ $Pv = nRT$

$\Rightarrow -V = \frac{3.12\times0.0821\times300}{32\times1} = 2.4L \Rightarrow$ Volume adsorbed per gram $= \frac{2.4}{1.2} = 2$

57. Sol: $\boxed{1}$

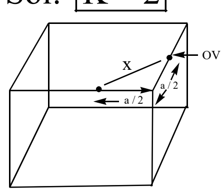
$2Mno_4^- + 5C_2O_4^{2-} + 16H^+ \rightarrow 2Mn^{+2} + 10CO_2 + 8H_2O \Rightarrow (5+16)-(2+10+8) = 1$

58. Sol: $\boxed{500}$

$\Delta S^o = 30 - \left[\frac{1}{2}\times40 + \frac{3}{2}\times20\right] = 30-(50) = -20JK^{-1}$

$\Rightarrow$ At equilibrium, $T\Delta S^o = \Delta H^o \Rightarrow T\times(-20JK^{-1}) = -10\times1000J \Rightarrow T = 500K$

59. Sol: $\boxed{K = 2}$



$x = \sqrt{\left(\frac{a}{2}\right)^2 + \left(\frac{a}{2}\right)^2} = \frac{a}{\sqrt{2}}$

60. Sol: $\boxed{10}$

$H_2CO_3 + NaOH \rightarrow NaHCO_3 + H_2O$

Millimole	10	10	-	-
At end	0	0	10+10=20.	

$\Rightarrow$ Final mixture has 20 milli moles $NaHCO_3$ and 10 millimoles Na_2CO_3

$P^H = Pka_2 + \log\frac{salt}{Acid}[Buffer: Na_2CO_3 + NaHCO_3]$

$\Rightarrow P^H = 10.31 + \log\left(\frac{10}{20}\right) \approx 10$

MATHEMATICS

61. Let the total population of town be x

$$\therefore \frac{25x}{100}+\frac{15x}{100}-1500+\frac{65x}{100}=x \Rightarrow \frac{105x}{100}-x=1500 \Rightarrow x=30000$$

62. Given system has infinitely many solutions

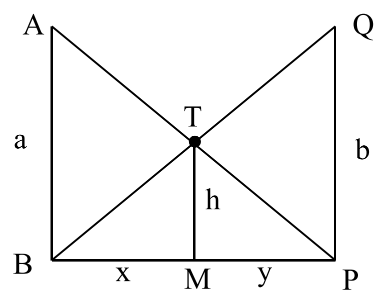
$$\alpha=\frac{k-26}{19}, \beta=\frac{11k+18}{19} \text{ and verify}$$

63.
$$r=\sqrt{5x^2-8x+14}$$

$$r>3 \quad \forall x \in \mathbb{R}$$

64.
$$: \frac{h}{y}=\frac{a}{x+y}, \frac{h}{x}=\frac{b}{x+y}$$

$$h=\frac{a}{\frac{x}{y}+1}; h=\frac{b}{1+\frac{y}{x}}$$



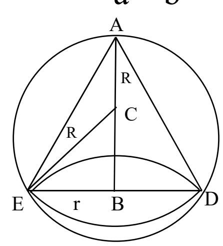
$$\frac{x}{y}+1=\frac{a}{h}$$

$$\frac{x}{y}=\frac{a}{h}-1 \qquad =\frac{a-h}{h}$$

$$\frac{y}{x}=\frac{h}{a-h}$$

$$h=\frac{b}{1+\frac{h}{a-b}} \Rightarrow h=\frac{ab}{a+b}$$

65.



Let AB=h

BC=h-R

$$r^2=4hR-h^2 \text{ and } v=\frac{1}{3}\pi r^2 h$$

$$\therefore v=\frac{1}{3}\pi\left(4hR-h^2\right)h$$

$$\frac{dv}{dh}=0 \Rightarrow r=4$$

66. Point of intersection of the given curves is (6, 12)

$\therefore$ Equation of the normal at P(6, 12) to $y^2 = 24x$ is $x + y - 18 = 0$

67. Conceptual

68. $9y^2 = x^3 \ldots\ldots\ldots(1)$

$y' = \dfrac{x^2}{6y} = -1 \qquad (\text{Given slope of normal} = -1)$

$\Rightarrow 6y = x^2 \ldots\ldots\ldots(2)$

Solving (1) and (2) we get $P\left(4, \dfrac{8}{3}\right)$

$\therefore$ Equation of tangent at P is $3x - 3y - 4 = 0$

69. Take $\sqrt{x} = t$

$$\int_0^1 \frac{\sqrt{x}}{(1+x)(3+x)}dx = \int_0^1 \frac{3\left(1+T^2\right)-\left(3+T^2\right)}{\left(1+T^2\right)\left(3+T^2\right)}dt$$

70.

$$\left(\frac{dx}{x}-\frac{dy}{y}\right)+\frac{\dfrac{dy}{y^2}-\dfrac{dx}{x^2}}{\left(\dfrac{1}{y}-\dfrac{1}{x}\right)^2}=0$$

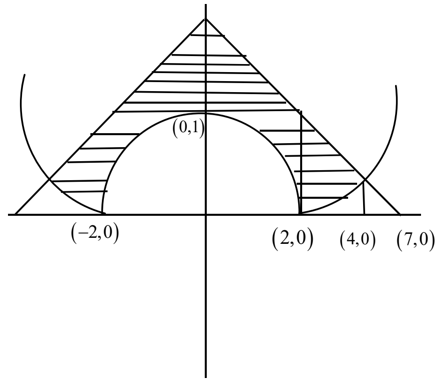
$$\frac{dx}{x}-\frac{dy}{y}+d\left(\frac{1}{\dfrac{1}{y}-\dfrac{1}{x}}\right)=0$$

$$\log|x|-\log|y|+\frac{1}{\dfrac{1}{y}-\dfrac{1}{x}}=c(\text{intigrated})$$

$$\log\left|\frac{x}{y}\right|+\frac{xy}{x-y}=c$$

71.

$$A = 2\int_0^2\left[(7-x)-\left(1-\frac{x^2}{4}\right)\right]dx + 2\int_2^4\left[(7-x)-\left(\frac{x^2}{4}-1\right)\right]dx = 32$$



72. $\sin ce\ \frac{-\pi}{2} \le \sin^{-1} x_i \le \frac{\pi}{2}$ and $\sum_{i=1}^{20} \sin^{-1} x_i = 10\pi$

$\Rightarrow \sin^{-1} x_i = \frac{\pi}{2} \forall 1 \le i \le 20$

$\therefore x_{i=1}, \quad 1 \le i \le 20$

$\therefore \sum_{i=1}^{20} x_i = 20$

$\therefore \frac{\sum_{i=1}^{20} x_i}{10} = 2$

73. : Centre of $S_1 = (2,4)$

Radius of S_1 = radius of $S_2 = 4$

Centre of circle $S_2 = (4,2)$

$S_2 = (x-4)^2 + (y-2)^2 = 16$

$= x^2 + y^2 - 8x - 4y + 4 = 0.........(1)$

Equation of the circle touching y=x at (1, 1) can be taken as

$(x-1)^2 + (y-1)^2 + \lambda(x-y) = 0......(2)$

$2\left(\frac{\lambda-2}{2}\right)(-4) + 2\left(\frac{-\lambda-2}{2}\right) + 2 = 4 + 2 \qquad (\therefore 1 \text{ and } 2 \text{ orthogonal})$

$\Rightarrow \lambda = 2$

$\lambda^2 + 2 = 6$

74. $F(x) = \begin{cases} x\sin\left(\frac{1}{x}\right), & x \ne 0 \\ 0, & x = 0 \end{cases}$

$\lim_{x\to 0} F(x) = \lim_{x\to 0} x\sin\left(\frac{1}{x}\right) = 0$

Also F (0) = 0

$\Rightarrow \lim_{x\to 0} F(x) = F(0)$

$\Rightarrow F(x)$ is continuous at x=0

$\Rightarrow F(x)$ is continuous for all real numbers

Statement-1 is true

$f_1(x) = x$

$\Rightarrow$ it is continuous on R

$$f_2(x) = \begin{cases} \sin\left(\frac{1}{x}\right) & , x \neq 0 \\ 0 & , x = 0 \end{cases}$$

$\lim_{x\to 0} \sin\frac{1}{x}$ does not exist

$\Rightarrow$ it is not continuous at x=0

$\Rightarrow f_2(x)$ is discontinuous on R

Thus statement-2 is false.

75.

$$\sum_{m=1}^{6} \frac{\sin\left[\left(\theta + m\frac{\pi}{4}\right) - \left(\theta + \frac{(m-1)\pi}{4}\right)\right]}{\sin\left(\theta + \frac{(m-1)\pi}{4}\sin(\theta + \frac{m\pi}{4}\right)} = 4$$

$$\Rightarrow \sum_{m=1}^{6} \left\{\cot\left(\theta + \frac{(m-1)\pi}{4}\right) - \cot\left(\theta + \frac{m\pi}{4}\right)\right\} = 4$$

$\Rightarrow \cot\theta - \cot\left(\theta + {}^{3\pi}/_{2}\right) = 4$

$\Rightarrow \cot\theta + \tan\theta = 4$

$\Rightarrow \tan\theta = 2 \pm \sqrt{3}$

$\Rightarrow \theta = {}^{\pi}/_{12}, {}^{5\pi}/_{12}\ n\left(\theta, {}^{\pi}/_{2}\right)$

$\therefore {}^{\pi}/_{12} - \frac{\pi}{12} = {}^{\pi}/_{3}$

76. Ans-$1 \times \left(3_{c_1} x 9^2\right) + 2\left(3_{c_2} \times 9\right) + 3 \times 1 = 300$

77. $b_3 > 4b_2 - 3b_1$

$b_1h^2 > 4b_1r - 3b_1$

$\left(r^2 - 4r + 3\right) > 0$

$r < 1$ or $r > 3$

78. CONCEPTUAL

79. USE EXPANSIONS

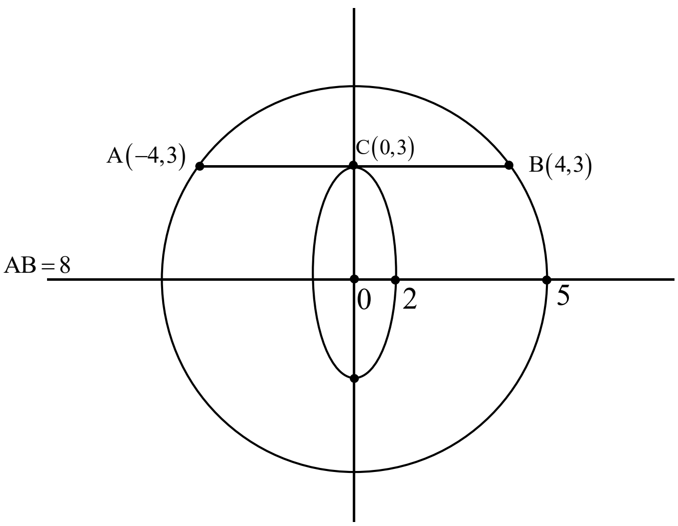
80. Ans - $f\left(3\pi/2\right) = 2\pi$

$$gl(2\pi) = \frac{1}{fl\left(3\pi/2\right)} = \frac{3}{7}$$

81. $P(x \ge 2) \ge \frac{99}{100} \Rightarrow 1 - P(x=0) - P(x=1) \ge \frac{99}{100}$

$$\Rightarrow \frac{1}{100} \ge \frac{3^n + 1}{4^n} \Rightarrow n = 6$$

82.



83. $\text{Mean} = \frac{12+14}{2} = 13$

$$\alpha^2 = \frac{12^2 + 14^2}{2} - 13^2 = 1 \ (\text{variance})$$

$$\text{mean} = \frac{12 + 14 + \alpha + \beta}{4} = 13$$

$\alpha + \beta = 26................(1)$

$$\alpha^2 = \frac{12^2 + 14^2 + \alpha^2 + \beta^2}{4} - 13^2 = 1$$

$\Rightarrow \alpha^2 + \beta^2 = 340.....(2)$

by (1) and (2)

$|\alpha - \beta| = 2$

84.
$$\begin{vmatrix} 1 & x-2 & 4 \\ 1 & 0 & -3 \\ 3 & 3 & -2 \end{vmatrix} = 0$$

85. Solution: $2^m = 56 + 2^n$

$\Rightarrow 2^m - 2^n = 56$

$$\Rightarrow 2^n - (2^{m-n} - 1) = 56$$

$$m = 6, n = 3$$

86.

$$\text{Ans- } 2f\left(x^2\right) + 3f\left(\frac{1}{x^2}\right) = x^2 - 1$$

$$2f\left(\frac{1}{x^2}\right) + 3f\left(x^2\right) = \frac{1-x^2}{x^2}$$

By soluving we get

$$f\left(x^2\right) = \frac{\left(1-x^2\right)\left(3+2x^2\right)}{5x^2}$$

$$\text{Take } x = \frac{1}{52}$$

87.

$$\text{Ans: } \frac{1+z+z^2}{1-z+z^2} = 1 + \frac{22}{1-z+z^2} \in R$$

$$\Leftrightarrow \frac{z}{1-z+z^2} \in R$$

$$\Leftrightarrow \frac{1-z+z^2}{z} \in R$$

$$\Leftrightarrow \frac{1}{z} + z - 1 \in R$$

$$\Leftrightarrow \frac{1}{z} + z = \frac{1}{2} + 2$$

$$z - \bar{z} = \frac{1}{z} - \frac{1}{\bar{z}}$$

$$z - \bar{z} = \frac{z - \bar{z}}{z\bar{z}}$$

$$z\bar{z} = 1 \Rightarrow |z| = 1 \because z \neq \bar{z}$$

88.

$$\text{Ans- Put } \sqrt{x^2+11} = \tau \Rightarrow x^2 = \tau^2 - 11$$

$$\sqrt{t^2+\tau-11} + \sqrt{\tau^2-\tau-11} = 4 - 1$$

$$\text{Clearly } \left(t^2+t-11\right) - \left(t^2-t-11\right) = 2t \to 2$$

$$\frac{2}{1} = \frac{\left(\tau^2 t - 11\right) - \tau^2 t - 11}{\sqrt{\tau^2+\tau-11} + \sqrt{\tau^2-\tau-11}} = \frac{\tau}{2}$$

$$\Rightarrow \sqrt{\tau^2+t-11} - \sqrt{\tau^2-\tau-11} = \frac{T}{2} - 3$$

$1+2 \Rightarrow \tau^2+\tau-11\left(2+\frac{\tau}{4}\right)^2$

$\Rightarrow \tau=4 \Rightarrow x^2+1=16$

$x^2=5$

$x \pm \sqrt{5}$

89. Ans -Let $y=3^{\log_3 \sqrt{9^{1x-21}}}$

$\Rightarrow y=3^{1x-21}$

$\therefore$ G.E is $(y+z)^7$

$T_6=\underset{5}{\overset{7}{C}} Y^2 Z^5$

$567=21.\left(3^{2|x-2|}\right)\left(1.3^{|x-2|}-9\right)$

$27=43^{3|3-2|}-93^{2|x-2|}$

$\Rightarrow 4\tau^3-9\tau^2-27=0 \text{ where } \tau=3^{|x-2|}$

$\therefore \tau=3 \text{ satisfies}$

$z=7^{\frac{1}{5}} \log_7\left[4.3^{|x-2|}-9\right]$

$z=\left(4.3^{|x-2|}-9\right)^{11} 5$

$3^{|x-2|}=3$

$x=2 \pm 1$

=3,1

90. Ans –

$$f(x)=\begin{cases}-x-1, & -1 \le x<0 \\ 0, & x=0 \\ x, & 0<x<1 \\ 2x-1, & 1 \le x<2 \\ x+1 & 2 \le x<3 \\ 5 & x=3\end{cases}$$

$\therefore a=3, b=4$