1. (d)

$$k=\frac{P^2}{2\text{ m}}=\frac{h^2}{2\text{ m}\lambda^2}$$

$$=\frac{(6.62\times10^{-34})^2}{2\times9.1\times10^{-31}\times(7.5\times10^{-12})^2}\times\frac{1}{1.6\times10^{-19}}\text{eV}$$

Alternate method

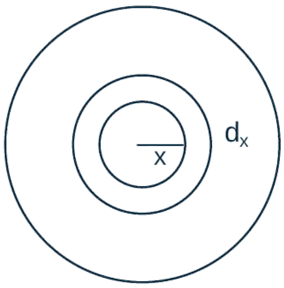
$$\lambda=\sqrt{\frac{150}{V}}$$

$$\Rightarrow 7.5\times10^{-12}=\sqrt{\frac{150}{V}}$$

$$V=\frac{80}{3}\text{kV}$$

$$\text{Energy }=\frac{80}{3}\text{keV}\simeq 25\text{keV}$$

2. (d)



$$d\tau=(\mu dN)x$$

$$=\mu\left(\frac{F}{\pi R^2}\times 2\pi\times dx\right)x$$

$$\tau=\int_0^R d\tau$$

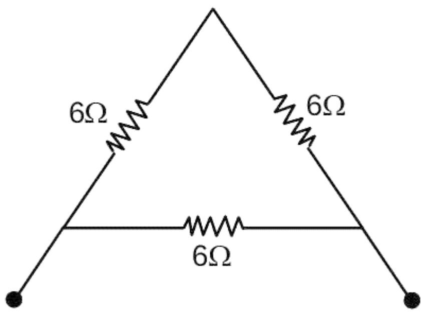
3. (c) $V_{AJ}=IR_{AJ}$

$$\frac{E}{3}=\left(\frac{E}{12r+3r}\right)\times\left(\frac{x}{L}\times 12r\right)$$

4. (a)

5. (c)

6. (a)



$R_{net}=4\Omega$

7. (d)

$W = Fs\cos\theta$

$= m\left(g+\frac{g}{2}\right)\times\left[\frac{1}{2}\times\frac{g}{2}\times t^{2}\right]$

8. (a) For maxima,

$d\sin\theta = n\lambda$

$\lambda = \frac{d\theta}{n}$ ($\because \sin\theta \approx \theta$ when θ is small)

$= \frac{2500}{n}$ nm

Take $n = 4,5$ for $\lambda = 625$ nm and 500 nm.

9. (a) Area $\propto \pi(\text{ Range })^{2} \propto v^{4}$

$\therefore \frac{A_1}{A_2} = \left(\frac{1}{2}\right)^{4}$

10. (a)

$\frac{128\ \text{kg}}{\text{m}^3} = \frac{64(2\ \text{kg})}{10\ \text{cm}^3}$

$= \frac{64(2\ \text{kg})}{10^6(50\ \text{cm})^3}\times 50^3$

$= \frac{64\times 50\times 50\times 50}{100\times 100\times 100}\times\frac{2\ \text{kg}}{(50\ \text{cm})^3} = 8\frac{(2\ \text{kg})}{(50\ \text{cm}^3)}$

11. (d) Work done by external agent $= U_f - U_i$

$= 2MB$

12. (a) $\frac{\Delta Q}{\Delta t} = \frac{kA}{\ell}(T_2 - T_1)$

$\frac{1}{A}\left(\frac{\Delta Q}{\Delta t}\right) = \frac{k}{\ell}(T_2 - T_1)$

13. (c) $C_{net} = C_1 + C_2 + C_3$

$\frac{kAE_0}{d} = k_1\left(\frac{A}{3}\right)\frac{E_0}{d} + k_2\left(\frac{A}{3}\right)\frac{E_0}{d} + k_3\left(\frac{A}{3}\right)\frac{E_0}{d}$

$k = \frac{k_1 + k_2 + k_3}{3} = 12$

14. (d)

$Q_1 + q_2 + Q_3 = Q$

$\frac{Q_1}{4\pi a^2} = \frac{Q_2}{4\pi b^2} = \frac{Q_3}{4\pi c^2} = k$

Subs. Q_1, Q_2, Q_3 in (1)

$k = \frac{Q}{4\pi(a^2 + b^2 + c^2)}$

$v = \frac{kQ_1}{a} + \frac{kQ_2}{b} + \frac{kQ_3}{c}$

15. (b)

$n_1 = n_2 = n_3$

$\Rightarrow 1 - \frac{T_2}{T_1} = 1 - \frac{T_3}{T_2} = 1 - \frac{T_4}{T_3}$

$\Rightarrow \frac{T_2}{T_1} = \frac{T_3}{T_2} = \frac{T_4}{T_3}$

$\Rightarrow T_2\ T_3 = T_1\ T_4$ and $\frac{T_3^2}{T_2} = T_4$

Solve for T_2 and T_3.

16. (b) Initially, kinetic energy $= \frac{1}{2}mv^2 = \frac{1}{2}m\frac{GM_e}{r}$

By conservation of M.E.,

$$\frac{-GM_e m}{r} + KE = 0$$

$$KE = \frac{GM_e m}{r} = mv^2$$

17. (a) $\frac{dV}{dt} = \phi - a\sqrt{2gh} = 0$ (for maximum height)

$$h = \frac{\phi^2}{2ga^2} = \frac{10^{-8}}{2 \times 9.8 \times 10^{-8}} = 5.1 \text{ cm}$$

18. (d) $f = \frac{n}{2\ell}\sqrt{\frac{T}{m}}$

On solving, $n = 5$,

5 loops are formed in 1 m.

$\therefore$ Separation between successive nodes $= \frac{1}{5}$ m $= 20$ cm

19. (b) $f_1 = f_o\left(\frac{340}{340-17}\right)$; $f_2 = f_o\left(\frac{340}{340-34}\right)$

$\frac{f_1}{f_2} = \frac{306}{323}$ or $\frac{18\times17}{19\times17}$ or $\frac{18}{19}$

20. (b)

21. (c) $R = \overline{P+Q} = \overline{(\bar{x}+y) + (x\bar{y})}$

$= (\overline{\bar{x}+y}) \cdot (\overline{x\bar{y}})$

$= (x \cdot \bar{y}) \cdot (\overline{x\bar{y}})$

$= x\bar{y}$

22. (b)

23. (a) In 8 seconds count rate becomes $\frac{1}{16}$ times.

$\therefore$ 4 half lives $= 8$ s

1 half lie $= 2$ s

In 6 s or 3 half lives, count rate $= \frac{1600}{2^3} = 200$

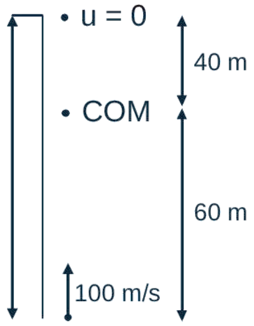
24. (a) $E = vB$

$v = Ed = dvB$

25. (d)
26. (c)
27. (a) By colour coding,

$$R = 50 \times 10^2 \Omega$$
$$I^2 R = P$$
$$I = \sqrt{\frac{P}{R}} = 20 \text{ mA}$$

28. (c)



Y_{cm} from ground $= \frac{0.03 \times 100}{0.05} = 60$ m

$$V_{cm} = \frac{0.02 \times 100}{0.05} = 40 \text{ m/s}$$

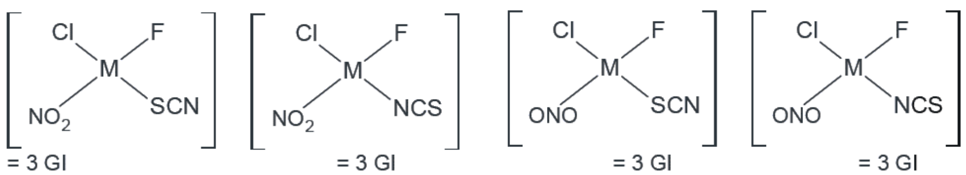
$$H = \frac{V_{cm}^2}{2g} = \frac{40 \times 40}{20} = 80 \text{ m}$$

Height above building $= 80 - 40 = 40$ m

29. (c) $dM = diA$

$$= \left(\frac{dq\omega}{2\pi}\right) \pi x^2$$
$$= (\rho dx) \frac{\omega}{2\pi} \pi x^2$$
$$M = \int_0^L dM$$

30. (d)
31. (d)



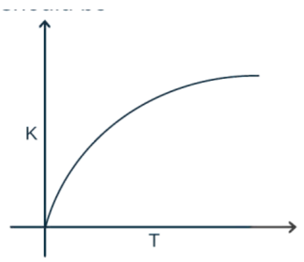
Total = 12 GI

32. (c)
33. (b)
34. (a)
35. (a)
36. (a)
37. (a)
38. (a)

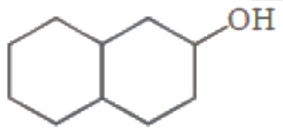
$K = Ae^{-E_a/RT}$

(i) is true but (ii) is false

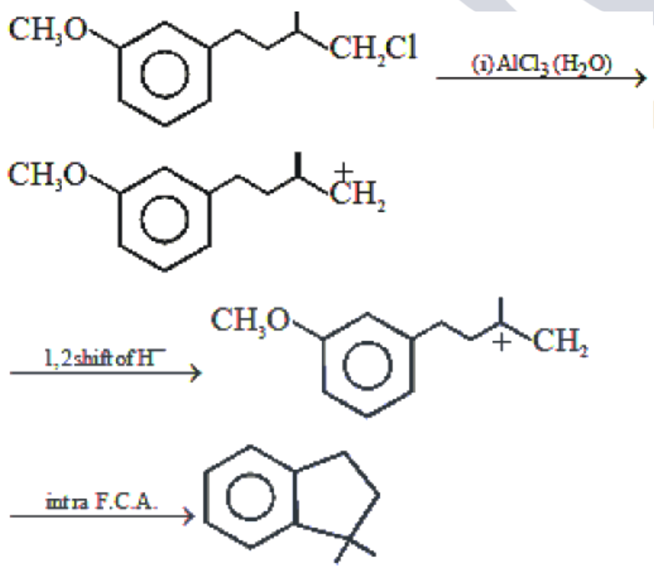
(ii) should be



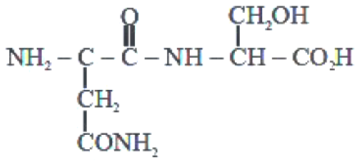
39. (c) answer should be



40. (c)
41. (a) Density of DCM is higher than H_2O.
42. (a) Adipic acid will give unstable 7 membered anhydride.
43. (b) Electron withdrawing group enhances the rate of hydrolysis.
44. (C) $K.E = hv - hv_0,$
45. (b)
46. (c) Atomic & ionic radii decreases
47. (b)
48. (d)

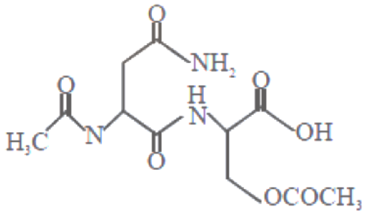


49. (b)

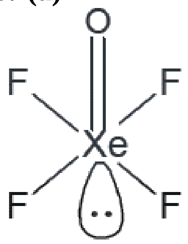


$$Asn - Ser + \underset{excess}{(CH_3CO)_2O} \xrightarrow{NEt_3} P$$

P is



50. (a)



51. (b)
52. (b)
53. (d)
54. (a)

$Ca(OH)_2$	$+ Na_2SO_4$	$\longrightarrow CaSO_4$	$+ 2NaOH$
100 m mol	14 m mol	—	—
—	—	14 m mol	28 m mol

$$w_{CaSO_4} = 14 \times 10^{-3} \times 136 = 1.9\text{gm}$$

$$[OH^-] = \frac{28}{100} = 0.28M$$

55. (b) $P_A = \chi_A P_A^0 = Y_A P_T$

$P_T = \chi_A P_A^0 + \chi_B P_B^0 = 0.4 \times 7 \times 10^3 + 0.6 \times 12 \times 10^3 = 10^4$

$0.4 \times 7 \times 10^3 = Y_A \times 10^4$

$Y_A = 0.28$

$Y_B = 1 - 0.28 = 0.72$

56. (d) $NaBH_4$ don't reduce ester.
57. (d)
58. (d) Higher the Ka value lower the pKa value.
59. (c) Hall-Herolut's process is given by

$$2Al_2O_3 + 3C \longrightarrow 4Al + 3CO_2$$
$$2Al_2O_3(\ell) \rightleftharpoons 4Al^{3+}(\ell) + 6O^{2-}(\ell)$$

At cathode: $4Al^{3+}(\ell) + 12e^- \longrightarrow 4Al(\ell)$

At anode: $6O^{2-}(\ell) \longrightarrow 3O_2(g) + 12e^-$

$2C + 3O_2 \longrightarrow 3CO_2(\uparrow)$

60. (d)

$$N_2^{\oplus} \Rightarrow BO = 2.5 \Rightarrow \left[\pi - \text{ Bond } = 2\&\sigma - \text{ Bond } = \frac{1}{2}\right]$$
$$N_2 \Rightarrow \text{B.O. } = 3.0 \Rightarrow [\pi - \text{ Bond } = 2\&\sigma - \text{ Bond } = 1]$$
$$O_2 \oplus = \text{ B.O. } \Rightarrow 2.5 \Rightarrow [\pi - \text{ Bond } = 1.5\&\sigma - \text{ Bond } = 1]$$
$$O_2 \Rightarrow \text{ B.O. } \Rightarrow 2 \Rightarrow [\pi - \text{ Bond } \Rightarrow 1\&\sigma - \text{ Bond } = 1]$$

61. (c) P(7 or 8)

$= \mathrm{P(H)P(7 \text{ or } 8) + P(T)P(7 \text{ or } 8)} = \frac{1}{2} \times \frac{11}{36} + \frac{1}{2} \times \frac{2}{9} = \frac{11}{72} + \frac{1}{9} = \frac{19}{72}$

62. (a) Let P be the point nearest to $\left(\frac{3}{2}, 0\right)$, then normal at P will pass through $\left(\frac{3}{2}, 0\right)$.

Let Co - ordinates of P be s $\left(\frac{t^2}{4}, \frac{t}{2}\right)$

Hence equation of normal is $y + tx = \frac{t}{2} + \frac{t^2}{4}$

The line passes through $\left(\frac{3}{2}, 0\right)$

$\frac{3t}{2} = \frac{t}{2} + \frac{t^3}{4} \Rightarrow t = 2$ ($-2,0$ are rejected)

hence nearest point is $(1,1)$

distance $\sqrt{\left(\frac{3}{2} - 1\right)^2 + (1 - 0)^2} = \frac{\sqrt{5}}{2}$

63. (b) $\vec{n} = \vec{n}_1 \times \vec{n}_2 = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 3 & -1 & 2 \\ 1 & 2 & 3 \end{vmatrix} = 7\hat{i} - 7\hat{j} + 7\hat{k}$

Equation of plane is $-7(x - 4) - 7(y + 1) + 7(z - 2) = 0$

$\Rightarrow -7x - 7y + 7z + 7 = 0 \Rightarrow x + y - z = 1$

64. (b) $\mu = \frac{1+3+8+x+y}{5}$

$25 = 12 + x + y \Rightarrow x + y = 13$

$$\sigma^2 = \frac{\sum(x_i - \mu)^2}{N}$$

$$9.2 = \frac{1 + 9 + 64 + x^2 + y^2}{5} - 25$$

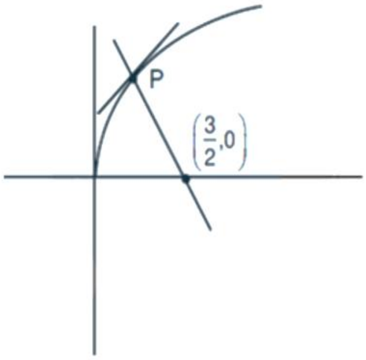
$34.2 \times 5 = 74 + x^2 + y^2$

$171 = 74 + x^2 + y^2$

$97 = x^2 + y^2$

$(x+y)^2 = x^2 + y^2 + 2xy$

$169 - 97 = 2xy \Rightarrow xy = 36$



T = 4,9

So ratio is $\frac{4}{9}$ or $\frac{9}{4}$

65. (c) $5, 5r, 5r^2$ sides of triangle,

$5 + 5r > 5r^2$

$5 + 5r^2 > 5r$

$5r + 5r^2 > 5$

From $r^2 - r - 1 < 0$

$$\left[r - \left(\frac{1-\sqrt{5}}{2}, \frac{1+\sqrt{5}}{2}\right)\right]$$

From (2)

$r^2 - r + 1 > 0 \Rightarrow r \in R$

From (3)

$r^2 + r - 1 > 0$

So, $\left(r + \frac{\sqrt{1+\sqrt{5}}}{2}\right)\left(r + \frac{1-\sqrt{5}}{2}\right) > 0$

$$r \in \left(-\infty, \frac{1+\sqrt{5}}{2}\right) \cup \left(-\frac{1-\sqrt{5}}{2}, \infty\right)$$

From (4), (5), (6) $r \in \left(\frac{-1+\sqrt{5}}{2}, \frac{1+\sqrt{5}}{2}\right)$

66. (d) $\sum_{i=1}^{20}\left(\frac{{}^{20}C_{1-1}}{{}^{20}C_1 + {}^{20}C_{t-1}}\right)^3$

Now $\frac{{}^{20}C_{1-1}}{{}^{20}C_1 + {}^{20}C_{1-1}} = \frac{{}^{20}C_{1-1}}{{}^{21}C_1} = \frac{1}{21}$

Let given sum be S, so

$S = \sum_{i=1}^{20} \frac{(i)^3}{21^3} = \frac{1}{(21)^3}\left(\frac{20.21}{2}\right)^2 = \frac{100}{21}$

Given $S = \frac{k}{21} \Rightarrow k = 100$

67. (c) $\sin^2 2\theta + \cos^4 2\theta = \frac{3}{4}$

Let $\cos^2 2\theta = \mathrm{t}$

$\Rightarrow 1 - \cos^2 2\theta + \cos^4 2\theta = \frac{3}{4}$

$\Rightarrow \mathrm{t} = \frac{1}{2} \Rightarrow \cos^2 2\theta = \frac{1}{2}$

$\Rightarrow 2\cos^2 2\theta - 1 = 0 \Rightarrow \cos 4\theta = 0$

$\Rightarrow 4\theta = (2n+1)\frac{\pi}{2}$

$\Rightarrow \theta = (2n+1)\frac{\pi}{8} \Rightarrow \theta = \frac{\pi}{8}, \frac{3\pi}{8} \in \left[0, \frac{\pi}{2}\right]$

Sum of values of θ is $\frac{\pi}{2}$

68. (d)

69. (a) $\frac{dy}{dx} + (3\sec^2 x)y = \sec^2 x$

This is linear differential equation

Integrating factor $= \mathrm{e}^{\int 3\sec^2 x\mathrm{dx}} = \mathrm{e}^{3\tan x}$

Hence $y \cdot e^{3\tan x} = e^{\int 3\tan x} \cdot \sec^2 xdx$

$\Rightarrow y\mathrm{e}^{3\tan x} = \frac{\mathrm{e}^{3\tan x}}{3} + c$

$\Rightarrow \mathrm{y} = \mathrm{Ce}^{-3\tan x} + \frac{1}{3}$

Given $\mathrm{y}\left(\frac{\pi}{4}\right) = \frac{4}{3} \Rightarrow \frac{4}{3} = \mathrm{Ce}^{-3} + \frac{1}{3}$

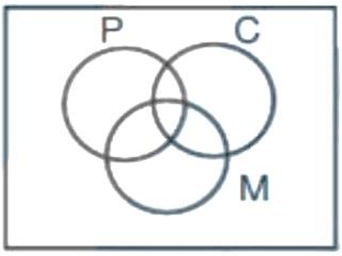
$\Rightarrow \mathrm{C} = \mathrm{e}^3$

Hence $y\left(\frac{\pi}{4}\right) = e^3 \cdot e^3 + \frac{1}{3} = e^6 + \frac{1}{3}$

70. (d) $\mathrm{n(p)} = \left[\frac{140}{3}\right] = 46$

$n(C) = \left[\frac{140}{5}\right] = 28$

$n(M) = \left[\frac{140}{2}\right] = 70$



$n(P \cup C \cup M) = n(P) + n(C) + n(M) - n(P \cap C) - n(C \cap M) - n(M \cap P) + n(P \cap M \cap C)$

$= 46 + 28 + 70 - \left[\frac{140}{15}\right] - \left[\frac{140}{10}\right] - \left[\frac{140}{6}\right] + \left[\frac{140}{30}\right]$

$= 144 - 9 - 14 - 23 + 4 = 102$

So required number of student $= 140 - 102 = 38$

71. (a) In the expansion of $\left(1 + x^{\log_2 x}\right)^5$

third term say $T_3 = {}^5C_2\left(x^{\log_2 x}\right)^2 = 2560$

$\Rightarrow \left(x^{\mathrm{lo}_2 x}\right)^2 = 256$

taking lograthium to the base 2 on both sides

$\Rightarrow 2(\log_2 x)^2 = 8 \Rightarrow (\log_2 x) = \pm 2$

$\Rightarrow x = 4, \frac{1}{4}$

Here $x = \frac{1}{4}$

72. (a,b,c,d)

Normal to there 2 curves are

$y = m(x - c) - 2bm - bm^3$

$y = mx - 4am - 2am^3$

If they how a common normal

$(c + 2b) - 4a = (2a - b)m^2 (m = 0$ corresponds to axis)

$\Rightarrow m^2 = \frac{c}{2a - b} - 2 > 0$

$\frac{c}{2a - b} > 2$

According to the question answer is (1,2,3,4) but my be in question they want common normal other than x - axis, hence answer is (b)

73. (b) $x + y - z = 5$

$x + 2y + 3z = 9,$

$x + 3y + \alpha z = \beta$

$D = \begin{vmatrix} 1 & 1 & 1 \\ 1 & 2 & 3 \\ 1 & 3 & 0 \end{vmatrix} = 0 \Rightarrow (2\alpha - 9) + (3 - \alpha) + (3 - 2) = 0 \Rightarrow \alpha = 5$

Now, $D_3 = \begin{vmatrix} 1 & 1 & 5 \\ 1 & 2 & 9 \\ 1 & 3 & \beta \end{vmatrix} = 0 \Rightarrow 2\beta - 27 + 9\beta - 5(3 - 2) = 0 \Rightarrow \beta = 13$

$\Rightarrow$ at $\alpha = 5, b = 13$ above 3 planes from common line

74. (b) $\operatorname{Lim}_{x\to 1+} \frac{(1-|x|+\sin|1-x|)\sin\left([1-x]\frac{\pi}{2}\right)}{|1-x|[1-x]}$

$= \operatorname{Lim}_{x\to 1^-} \dfrac{(1 - x + \sin(x-1))\sin\left(-\frac{\pi}{2}\right)}{(x-1)(-1)}$

$= \operatorname{Lim}_{x\to 1} \dfrac{-(x-1) + \sin(x-1)}{(x-1)} = -1 + 1 = 0$

75. (a) $|A| = \begin{vmatrix} -2 & 4+d & (\sin\theta - 2) \\ 1 & (\sin\theta) + 2 & d \\ 5 & (2\sin\theta) - d & (-\sin\theta) + 2 + 2d \end{vmatrix}$

$= \begin{vmatrix} -2 & 4+d & (\sin\theta - 2) \\ 1 & (\sin\theta) & d \\ 1 & 0 & 0 \end{vmatrix}$ (New $R_3 = R_3 - 2R_2 + R_1$)

$= (4+d)d - \sin^2\theta + 4 = (d+2)^2 - \sin^2\theta$

Because minimum value of $|A| = 8 \Rightarrow (d+2)^2 = 9 \Rightarrow d = 1$ or -5

76. (BONUS)

$\left|\frac{3z_1}{2z_2}\right| = 2$

Let $\dfrac{3z_1}{2z_2} = 2\cos\theta + 2(\sin\theta)i$

$\Rightarrow \dfrac{2z_2}{3z_1} = \dfrac{1}{2}\cos\theta - \dfrac{1}{2}(\sin\theta)$

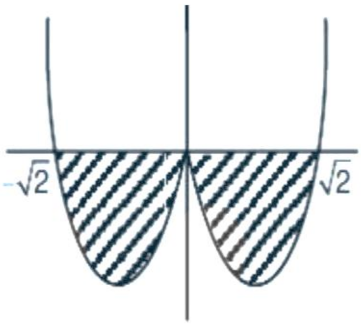
Given, $z = \frac{2z_1}{3z_2} + \frac{3z_2}{2z_1} = \frac{5}{2}\cos\theta + \frac{3}{2}(\sin\theta)i$

Which is neither purely real nor purely imaginary and $|z|$ depends on θ.

77. (d)

$\int_a^b (x^4 - 2x^2)dx$

From figure min area is $(-\sqrt{2}, \sqrt{2})$



78. (c) Let point P is (α, β) and centroid of $\triangle$ PQR is (h, k), then $3\mathrm{~h}=\alpha+1+3$ and $3\mathrm{k}=\beta+4-2$

$\Rightarrow \alpha=3\mathrm{~h}-4$ and $\beta=3\mathrm{k}-2$

Because (α, β) lies on $2x-3y+4=0$

$\Rightarrow 2(3\mathrm{~h}-4)-3(\mathrm{k}-2)+4=0$

$\Rightarrow$ locus is $6x-9y+2=0$ whose slope is $\frac{2}{3}$

79. (b) From the graph we can easily conclude that $f(x)$ is non - derivable at $x=-2,-1,0,1,2$

80. (c) Tangent at $(1,-1)$ is $x(1)+y(-1)+2(x+1)-3(y-1)-12=0$

$=3\mathrm{x}-4\mathrm{y}=7$

Required circle is $(x-1)^2+(y+1)^2+\lambda(3x-4y-7)=0$

It pass through $(4,0)$

$\Rightarrow 9+1+\lambda(12-7)=0 \Rightarrow \lambda=-2$

$\Rightarrow$ required circle is $x^2+y^2-8x+10y+16=0$

$\Rightarrow$ Radius $=\sqrt{16+25-16}=5$

81. (c)

$f(x)=x^3+ax^2+bx+c$

$f'(x)=3x^2+2ax+b$

$f''(x)=6x+2a$

$f'''(x)=6a=f'(1)=3+2a+b \Rightarrow a+b=-3$
$b=f''=12+2a \Rightarrow 2a-b=-12$
$c=f'''(3) \Rightarrow c=6$ and $a=-5, b=2$
$\Rightarrow f(x)=x^2-5x^2+2x+6$
$\Rightarrow f(2)=8-20+4+6=-2$

82. (b) Because $b=2\vec{a}$, so $3-\lambda_2=2\lambda_1$

Because a is perpendicular to c so $6+6\lambda_1+3(\lambda_3-1)=0$

$\Rightarrow(\lambda_1, \lambda_2, \lambda_3)=(\lambda_1, 3-2\lambda_1,-1-2\lambda_1)$ where $\lambda_1 \in \mathrm{R}$

$\Rightarrow\left(-\frac{1}{2}, 4,0\right)$ satisfied above triplet.

83. (a) Let A is $(1-3\mu, \mu-1, 2+5\mu)$

$\overrightarrow{AB} = (3\mu+2)\mathrm{i} + (3-\mu)\mathrm{j} + (4-5\mu)$

$\hat{k}$ which is parallel to plane $x - 4y + 3z = 1$

$\Rightarrow 1(3\mu+2) - 4(3-\mu) + 3(4-5\mu) = 0$

$= -8\mu + 2 = 0 \Rightarrow \mu = \dfrac{1}{4}$

84. (c) $\int \frac{(\sin^n\theta - \sin\theta)^{\frac{1}{n}}\cos\theta}{\sin^{n+1}\theta}d\theta$

$= \int \frac{(t^n - t)^n dt}{t^{n+1}}$ (Put $\sin\theta = t$)

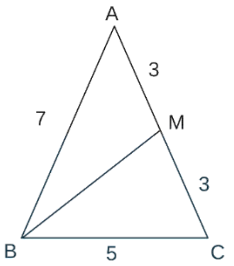
$$= \int \frac{t\left(1-\frac{1}{t^{n-1}}\right)^{\frac{1}{n}}}{t^{n+1}}dt = \int \frac{\left(1-\frac{1}{t^{n-1}}\right)^{\frac{1}{n}}}{t^n}dt$$

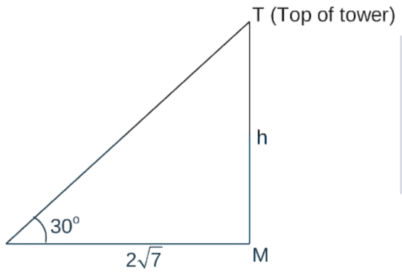
Put $1 - \frac{1}{t^{n-1}} = z \Rightarrow \frac{(n-1)}{t^n}dt = dz$,

$$\Rightarrow I = \frac{1}{n-1}\int z^{\frac{1}{n}}dz = \frac{z^{\frac{1}{n}+1}}{\left(\frac{1}{n}+1\right)(n-1)} + c = \frac{n(1-t^{1-n})^{n+1}}{n^2-1} + c$$

$$= \frac{n}{n^2-1}\left(1 - \frac{1}{\sin^{n-1}\theta}\right)^{\frac{n+1}{n}} + c$$

85. (b) Length of median $BM = \frac{1}{2}\sqrt{2(BC^2 + BA^2) - (AC)^2} = \frac{1}{2}\sqrt{2(25+49) - 36}$





$$= \frac{1}{2}\sqrt{112} = \sqrt{\frac{112}{4}} = \sqrt{28} = 2\sqrt{7}$$

Let h be height of tower, given $\tan 30^\circ = \frac{h}{2\sqrt{h}} \Rightarrow h = 2\sqrt{\frac{7}{3}} = \sqrt{\frac{28}{3}}$

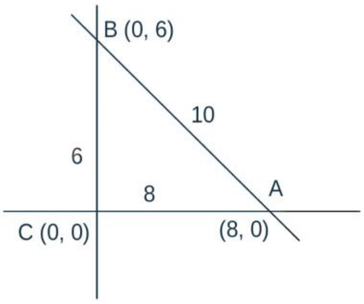
86. (a) Hyperbola is $\frac{x^2}{5} - \frac{y^2}{4} = 1$

Equation of its tangent in slope from is $y = mx \pm \sqrt{5m^2 - 4}$

Hence tangent with slope 1 is $y = x \pm 1$

87. (b) $I = \left(\frac{ax_1+bx_2+cx_3}{a+b+c}, \frac{ay_1+by_2+cy_2}{a+b+c}\right)$

$= \left(\frac{8(60)+6(0)+10(0)}{24}, \frac{10(0)+6(8)+8(0)}{24}\right) = (2,2)$



88. (d) Two -digit numbers of the form $7\lambda + 2$ are 16,23 … … … … . . . . ,93

Two digit numbers of the form $7\lambda + 5$ are 12,19 , … , 96

Sum of all the above numbers equals to $\frac{12}{2}(16+93) + \frac{13}{2}(12+96) = 654 + 702 = 1356$

89. (b) $y = kx^2, x = ky^2$

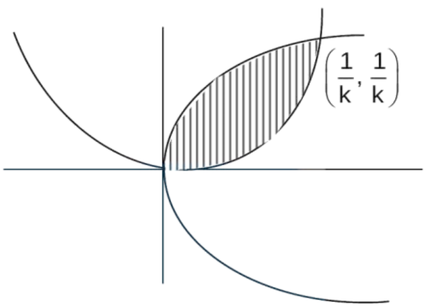
$\Rightarrow \mathrm{x} = \mathrm{k}(\mathrm{k}^2\mathrm{x}^4) \Rightarrow \mathrm{x} = 0$ or $\mathrm{x}^3 = \left(\frac{1}{\mathrm{k}}\right)^3 \Rightarrow \mathrm{x} = \frac{1}{\mathrm{k}}, 0$

Point of intersection are $\left(\frac{1}{\mathrm{k}}, \frac{1}{\mathrm{k}}\right)$ and $(0,0)$

Area $= \int_0^{1/k}\left(\sqrt{\frac{x}{k}} - kx^1\right)dx = 1 \Rightarrow \left(\frac{1}{\sqrt{k}}\frac{x^{3/2}}{3/2} - \frac{kx^3}{3}\right)^{1/k}$

$= 1 \Rightarrow \frac{2}{3\mathrm{k}^2} = 1 \Rightarrow \mathrm{k}^2 = \frac{1}{3}$

$k = \frac{1}{\sqrt{3}}$



90. (a) $P(n) = n^2 + 41$

$P(3) = 9 - 3 + 41 = 47$

$P(5) = 25 - 5 + 41 = 61$

Hence $P(3)$ and $P(5)$ are both prime