SOLUTIONS

WEEKLY TEST-B

RBA & RBS-1801

(JEE ADVANCED PATTERN)

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PHYSICS

1. The displacement between first stone and aeroplane after *t* second $(h_1) = \frac{1}{2}(g+f)t^2$

After time *t*,

Velocity of aeroplane $= u + ft$

Velocity of first stone $= u - gt$

Where *u* is velocity of aeroplane when first stone is dropped.

The relative speed of second stone with respect to first stone $= (u+ft)-(u-gt)$

$= (g+f)t$

The relative displacement between first and second stone after time $t'(h_2)$

$= (g+f)tt'$

$$h_1 + h_2 = \frac{1}{2}(g+f)t^2 + (g+f)tt' = \frac{1}{2}(g+f)(t+2t')t$$

$\therefore$ **(B)**

2. $\frac{1}{2}gt^2 = H$ … (i)

$gt = v_y$ …(ii)

$v_x = v_y$

Range = $u_x t = v_y t = gt^2 = 2H$

$\therefore$ **(B)**

3. $\frac{dx}{dt} = 2t - 2 = 0$ $\Rightarrow$ *t* = 1, So, $x_{t=0} = 1\text{m}$, $x_{t=1s} = 0$, $x_{t=3} = 4$ m

Total distance = 5m

$\therefore$ **(D)**

4. $a = v\frac{dv}{dx} = \frac{25}{(x+2)^3}$, $\frac{v^2}{2} = 25 \times \left[-\frac{1}{2(x+2)^2}\right]_o^x$, $v^2 = 25\left[\frac{1}{4} - \frac{1}{(x+2)^2}\right]$

$v = \sqrt{25\left[\frac{1}{4} - \frac{1}{(x+2)^2}\right]}$, $v_{max} = \frac{5}{2} = 2.5$ m/s (at $x = \infty$)

$\therefore$ **(A)**

5. **(A)**

$$\frac{\pi}{2}=\frac{1}{2}\alpha t_1^2 \qquad \pi=\frac{1}{2}\alpha t_2^2$$

$$t_1=\sqrt{\frac{\pi}{\alpha}} \qquad t_2=\sqrt{\frac{2\pi}{\alpha}}$$

$$v_1=r\alpha t_1 \qquad v_2=r\alpha t_2$$

$$a_{avg}=\frac{|\overrightarrow{\Delta v}|}{\Delta t}=\frac{\sqrt{v_1^2+v_2^2}}{t_2-t_1}=\frac{r\alpha\sqrt{3}}{\sqrt{2}-1}$$

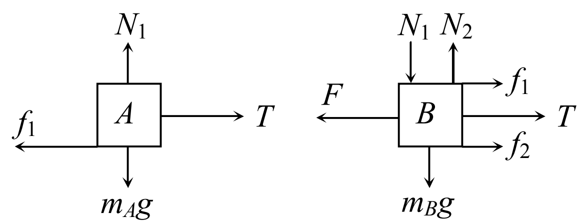
6. Force of friction on chain = weight of hanging chain.

$$\mu(l-x)\rho g=x\rho g \quad \Rightarrow \quad \mu(l-x)=x$$

$$x=\frac{\mu l}{1+\mu}=0.2l \quad \Rightarrow \quad \frac{x}{l}=0.2=20\%$$

$\therefore$ **(A)**

7. $m_A=0.5\,kg$; $m_B=1\,kg$



From F.B.D. of block *A*,

$$T=f_1=\mu m_A g=2N$$

From F.B.D. of block *B*,

$$f_2=\mu N_2=6N$$

$$F=T+f_1+f_2=2+2+6=10N$$

$\therefore$ **(B)**

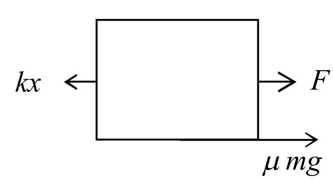
8. Block will return after maximum elongation.

i.e. $F.x_{max} - \frac{1}{2}Kx^2_{max} - \mu mgx_{max} = 0$

$$x_{max}=\frac{2(F-\mu mg)}{k}=\frac{8\mu mg}{k}$$

So block will finally comes to rest while returning i.e. $v=0$ & $a=0$

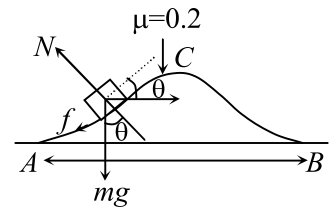
By work energy theorem while returning



$$-\left(\frac{1}{2}kx^2-\frac{1}{2}kx^2_{max}\right)-(F+\mu mg)(x_{max}-x)=0 \Rightarrow, x=\frac{4\mu mg}{k}$$

$\therefore$ **(B)**

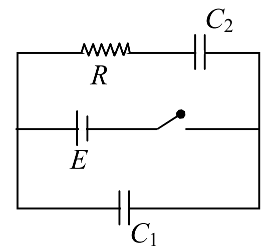
9. Work done by friction - $\int \vec{F}\cdot d\vec{s}$



$$-\int_0^x \mu mg\cos\theta\frac{dx}{\cos\theta}\quad -\mu mgx\ \text{- 20 J}$$

$\therefore$ **(C)**

10. Rearranging the circuit, we observed that C_1 is joined directly to the cell and acquires its full charge when S is closed. It plays no part in the charging of C_2 through R.



So, $q_2 = Q_0(1-e^{-t/\tau})$

$\therefore$ **(B)**

11. For $r < R$

From Gauss's law, $\oint \vec{E}.d\vec{A} = \frac{1}{\varepsilon_0}q$

i.e. $E4\pi r^2 = \frac{1}{\varepsilon}\int_0^r \rho_0\left(1-\frac{r}{R}\right)4\pi r^2 dr$

or $E = \frac{\rho_0}{\varepsilon}\left[\frac{r}{3}-\frac{r^2}{4R}\right]$

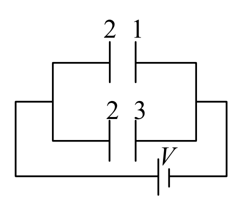
$\therefore$ **(A)**

12. For $r > R$

$$E.4\pi r^2 = \frac{1}{\varepsilon}\int_0^R \rho_0\left(1-\frac{r}{R}\right)4\pi r^2 dr \Rightarrow E = \frac{\rho_0 R^3}{12\varepsilon r^2}$$

$\therefore$ **(B)**

13. Both the capacitor are in parallel



Charge on plate (2) initially

$= \frac{2\varepsilon_0 A}{d}V$

$\therefore$ **(B)**

14. Charge on plate (2) finally = $\left(\frac{\varepsilon_0 A}{3d/2}+\frac{\varepsilon_0 A}{d/2}\right)V = \frac{8\varepsilon_0 A}{3d}V$

$\therefore$ **(C)**

15. $V_{CM} = \frac{Mv_0 + m(0)}{M+m}$

$\therefore$ **(D)**

16. **(A)**

17. **(A)**

At *A*, $mg\sin\theta + T_A = \frac{mv^2}{r}$, $T_A = m\left(\frac{v^2}{r} - g\sin\theta\right)$

At *B*, $T_B = \frac{mv_B^2}{r} = \frac{m}{r}\left(v^2 + 2gr\sin\theta\right)$

At *C*, $T_C - mg\sin\theta = \frac{mv_C^2}{r}$, $T_C = mg\sin\theta + \frac{m}{r}\left(v^2 + 2g.\,2r\sin\theta\right)$

$T_C = m\left(\frac{v^2}{r} + 5g\sin\theta\right)$

$\therefore$ **I – A, II-B, III-C, IV-D**

18. **(B)**

To shift block *A*, $Kx = \mu m_1 g$, $x = \frac{16}{100}$ m

Applying work energy theorem on block *B*

$W_F + W_{fr} + W_{sp} = 0$, $Fx - \frac{1}{2}Kx^2 - \mu m_2 gx = 0$, *F* = 40 N

W_{fr} on *B* = $-\mu m_2 gx$ = –(0.2) (16) (10) $\left(\frac{16}{100}\right)$ = –5.12

$W_F = Fx$ = (40) $\left(\frac{16}{100}\right)$ = 6.4

To shift block *B* , $Kx = \mu m_2 g$, $x = \frac{32}{100} m$

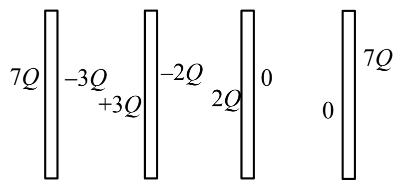
Applying work energy theorem on block *A*, $W_F + W_{Fr} + W_{sp} = 0$

$$F = \mu m_1 g + \frac{1}{2}Kx = (0.2)(8)(10) + \frac{1}{2}(100)\left(\frac{32}{100}\right) = 32 \text{ N}$$

$\therefore$ **(A) – 2; (B) – 1; (C) – 5; (D) – 4**

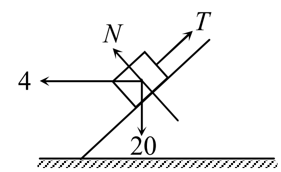
19. **(A)**

Charge distribution shown in diagram



$\therefore$ **(A) – 2, (B) – 4, (C) –1, (D) –3**

20. **(C)**



Acceleration of 2kg relative to wedge = 2 m/s^2

Acceleration of 2 kg relative to ground

$= \sqrt{2^2 + 2^2 + 2 \times 2 \times \cos 120^\circ}$ = 2 m/s^2

$$20\sin 60^\circ + 4\cos 60^\circ - T = 4$$

$$T = 10\sqrt{3} - 2$$

$N = 20\cos 60^\circ - 4\sin 60^\circ = 10 - 2\sqrt{3}$ N   Net force = 2 × 2 = 4 N

$\therefore$ **(A) – 2 , (B) – 1 , (C) – 3 , (D) –4**

CHEMISTRY

21. (A)

$$\frac{T_1}{T_2} = \left(\frac{V_2}{V_1}\right)^{(\gamma-1)} = x^{(1.4-1)} = x^{0.4}$$

$$\frac{Z_{1i}}{Z_{1f}} = \frac{V_{avi}V_2}{V_{avf}V_1} = \sqrt{\frac{T_1}{T_2}}x = x^{1.2}$$

22. (B)

pH = 2, [HCl] = 10^{-2} (M) & pOH = 2

or [NaOH] = 10^{-2} (M)

4 ml of 10^{-2} (M) HCl≡ 4 × 10^{-5} moles HCl.

6 ml of 10^{-2} (M) NaOH≡ 6 × 10^{-5} moles NaOH

After mixing excess moles of OH^- = 2 × 10^{-5}

$$[OH^-] = \frac{2\times10^{-5}}{10} \times 10^3 = 2 \times 10^{-3}$$

or pOH = 3 – log 2 = 3 – 0.3 = 2.7

or pH = 11.3

23. (B)

24. (D)

$\Delta H = \Delta E + \Delta nRT$

or $-\Delta nRT = \Delta E - \Delta H = 1200$

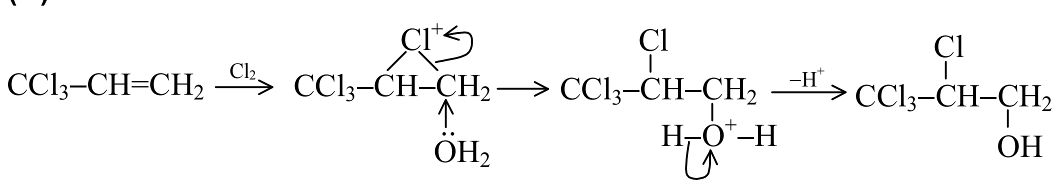
or $\Delta n = \dfrac{-1200}{2\times300} = -2$

$$\frac{K_p}{K_c} = (RT)^{\Delta n} = (0.0821 \times 300)^{-2} = (24.63)^{-2}$$

or = = 1.648×10^{-3}

or × 10^4 = 16.48 $\simeq$ 16.

25. (B)

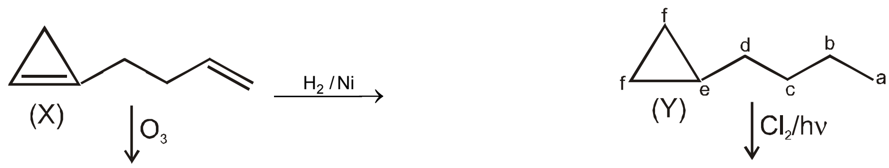


26. (D)

Total products are five and fractional distillation are three.

27. (C)

C_7H_{10} DU = 3



$HC(=O)–CH_2–C(=O)–CH_2–CH_2–CH=O$ + HCHO

6– products

28. (C)

29. (A)

30. (D)

In (A) and (B) use (z / e) concept for isoelectronic specie.

In (C) size of neutral atom is greater than its cation.

In (D) Se^{2-} and As^{3-} related with 4th period, while Ba^{2+} and Cs^{+} related with 6th period. (These are not isoelectronic species)

31. (A)

$\Delta_r G^0 = \Delta_r H^0 - T\Delta_r S^0$ At T = 0 K, $\Delta_r G^0 = \Delta_r H^0$

$\therefore \Delta_r H^0 = 100$ kJ/mol

32. (B)

When $\Delta_r G^0 = -RT \ln K_p^0 = 0$

or, $K_p^0 = 1$

$\therefore T = \dfrac{100}{4 \times 10^{-2}} = 2500$ K

33. (C)

Two diastereomeric esters and unreacted (+)-2-Butanol are obtained in different fractions.

34. (D)

Both the esters have two dissimilar chiral carbons hence both are optically active.

35. (A)

O-phen & en are symmetrical bidentate ligands

36. (D)

37. (B)

(A — S); (B — P); (C — Q); (D — R)

(A) Since Cu(S) is absent in the equilibrium expression, therefore with the addition of Cu(S) the equilibrium with be unaffected. $(A) \rightarrow S$

(B) On doubling the volume decreases, therefore reaction move to right. (B) $\rightarrow$ P

(C) $A^- + H_2O$ HA + OH^- in the presence of excess of H^+ the degree of hydrolysis of A^- will be greater.(C) $\rightarrow$ Q

(D) no of mole in reactant side less (D) $\rightarrow$R

38. (A)

39. (C)

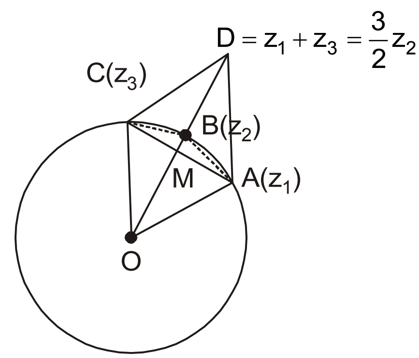
(A) – (P) ; (B) – (R) ; (C) – (S) ; (D) – (Q)

40. (D)

MATHEMATICS

41. (D)

OADC is a rhombus



$\therefore \quad M = \frac{3}{4}z_2$

$\therefore \quad OM = \frac{3}{4}, MB = \frac{1}{4}, OA = OB = 1$

$AM = \frac{\sqrt{7}}{4}$

$\therefore \quad$ Ar. of $\Delta OAC = \frac{3\sqrt{7}}{16}$ sq. units

Also, Ar. of $\Delta ABC = \frac{\sqrt{7}}{16}$ sq. units

$\therefore \quad$ Ar. of quadrilateral $OABC = \frac{\sqrt{7}}{4}$ sq. units

42. (B)

$a_i = 3^r 5^k$

$$\therefore \quad \frac{1}{a_1} + \frac{1}{a_2} + ... + \frac{1}{a_n} < \left(\frac{1}{3^0} + \frac{1}{3^1} + ...\right)\left(\frac{1}{5^0} + \frac{1}{5^1} + ...\right) = \frac{15}{8}$$

43. (A)

$$I=\int \frac{5x^6+12x^5}{(3x^6+x+2)^2}dx$$

$$I=\int \frac{\frac{5}{x^6}+\frac{12}{x^7}}{\left(3+\frac{1}{x^5}+\frac{2}{x^6}\right)^2}dx$$

Put $3+\frac{1}{x^5}+\frac{2}{x^6}=t$

$$\left(-\frac{5}{x^6}-\frac{12}{x^7}\right)dx=dt$$

$$I=\int -\frac{dt}{t^2}=\frac{1}{t}+c$$

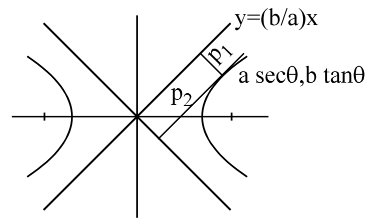
$$=\frac{1}{3+\frac{1}{x^5}+\frac{2}{x^6}}+c=\frac{x^6}{3x^6+x+2}$$

44. (A)

$$\frac{f(0)+f(2)}{2}=f(c);\ 0,<c<2$$

45. (B)

$$p_1p_2=\frac{a^2b^2}{a^2+b^2}=\frac{a^2.a^2(e^2-1)}{a^2e^2}=6$$

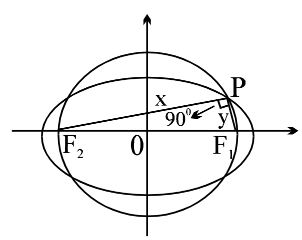


$$\frac{2a^2}{3}=6 \Rightarrow a^2=9 \Rightarrow a=3$$

hence $2a=6$

46. (C)

$x+y=17$; $xy=60$, To find $\sqrt{x^2+y^2}$



now, $x^2+y^2=(x+y)^2-2xy$

$=289-120=169$

$$\Rightarrow \sqrt{x^2+y^2}=13$$

47. (C)

$$\sin x\cos 2y\le 1 \text{ and } \cos x\sin 2y\le 1$$

$\Rightarrow (a^2-1)^2+1\le 1 \text{ and } a+1\le 1$

$\Rightarrow a=\pm 1 \text{ and } a\le 0$

Hence a = –1

48. (D)

Maximum and minimum possible slopes of PQ is along transverse common tangents of the circles.

Points of intersection of transverse common tangents is (9, 3)

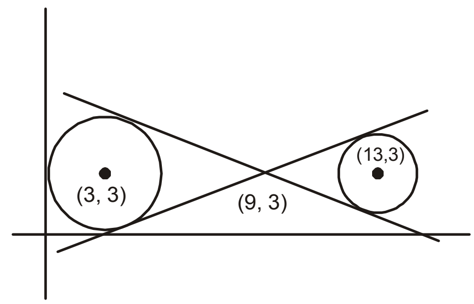
Hence equation of PQ is

$y-3=m(x-9)$

$\Rightarrow mx-y-9m+3=0$

It is tangent to circle C_1

Therefore $\frac{|6m|}{\sqrt{m^2+1}}=3 \Rightarrow 3m^2=1$



$\Rightarrow m=\pm\frac{1}{\sqrt{3}}$

$m\in\left[\frac{-1}{\sqrt{3}},\frac{1}{\sqrt{3}}\right]$

49. (B)

$\lim_{x\to\infty}\left(\sqrt[3]{(x+a)(x+b)(x+c)}-x\right)$

$=\lim_{x\to\infty}\frac{(x^3+(a+b+c)x^2+(ab+bc+ca)x+abc)-x^3}{((x+a)(x+b)(x+c))^{2/3}+x^2+x((x+a)(x+b)(x+c))^{1/3}} \quad \left(\because\ x-y=\frac{x^3-y^3}{x^2+xy+y^2}\right)$

$=\lim_{x\to\infty}\frac{(a+b+c)x^2+(ab+bc+ca)x+abc}{((x+a)(x+b)(x+c))^{2/3}+x^2+x((x+a)(x+b)(x+c))^{1/3}}$

$=\frac{a+b+c}{3}$ (Dividing numerator and denominator by x^2)

50. (C)

For $x=k-1$, $f(x)=(x-k)^2.\cos\left(\frac{1}{x-k}\right)-|x-(k-1)|$

Since $|x-(k-1)|$ is not diff. at x = k –1

Hence f(x) is also not diff. at x = k – 1

For x = k, $f'(k+h)=f'(k-h)=-1$

51. (B)

$AP^2 + BP^2 + CP^2 = |z - z_1|^2 + |z - z_2|^2 + |z - z_3|^2$

$= 3|z|^2 + |z_1|^2 + |z_2|^2 + |z_3|^2 - z(\bar{z}_1 + \bar{z}_2 + \bar{z}_3) - \bar{z}(z_1 + z_2 + z_3)$

$\because$ ΔABC is equilateral and circumcentre is at origin.

Hence, $z_1 + z_2 + z_3 = \bar{z}_1 + \bar{z}_2 + \bar{z}_3 = 0$

and $|z_1| = |z_2| = |z_3| = 2$

Also, $|z| = 1$ ($\because$ circumradius is 2)

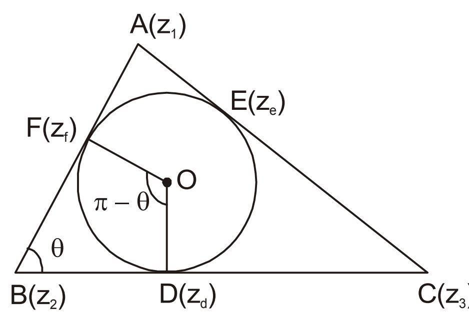
$\therefore$ $AP^2 + BP^2 + CP^2 = 3 \times 1 + 12 = 15$

52. (D)

O, F, B, D are concyclic.

So, $z_f - z_2 = (z_d - z_2)e^{i\theta}$ and $z_d = z_f e^{i(\pi - \theta)}$

$\Rightarrow$ $(z_f - z_2)z_d = -z_f(z_d - z_2)$



$\Rightarrow$ $\frac{1}{z_d} + \frac{1}{z_f} = \frac{2}{z_2}$

Similarly, $\frac{1}{z_d} + \frac{1}{z_e} = \frac{2}{z_3}$ and $\frac{1}{z_e} + \frac{1}{z_f} = \frac{2}{z_1}$

$\Rightarrow$ $\frac{1}{z_d} + \frac{1}{z_e} + \frac{1}{z_f} = \frac{1}{z_1} + \frac{1}{z_2} + \frac{1}{z_3} = 0$

$\therefore$ $\text{Re}\left(\frac{1}{z_d} + \frac{1}{z_e} + \frac{1}{z_f}\right) = 0$

53. (A)

$f(x) = \left(1 + 2x + \frac{2^2x^2}{2!} + \frac{2^3x^3}{3!} + \ldots \text{to } \infty\right) + 1$

and $g(x) = \left(1 + 2x + \frac{2^2x^2}{2!} + \frac{2^3x^3}{3!} + \ldots \text{ to} \infty\right) - 1$

Hence $f(x) = e^{2x} + 1$ and $g(x) = e^{2x} - 1$

$\int \frac{e^{2x} - 1}{e^{2x} + 1} dx = \int \frac{e^x - e^{-x}}{e^x + e^{-x}} dx = \log|e^x + e^{-x}| + C.$

54. (C)

$$\int \frac{e^{2x}+1}{\sqrt{e^{2x}-1}}\,dx = \int \frac{e^{2x}}{\sqrt{e^{2x}-1}}\,dx + \int \frac{1}{\sqrt{e^{2x}-1}}\,dx$$

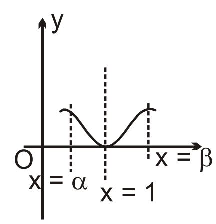
$$= \int \frac{e^{2x}}{\sqrt{e^{2x}-1}}\,dx + \int \frac{e^{x}}{e^{x}\sqrt{e^{2x}-1}}\,dx$$

$$= \sqrt{e^{2x}-1} + \sec^{-1}(e^{x}) + C$$

55. (D)

Since f(x) is symmetric about x = 1 and it is twice differntiable. so f'(x) must have one root at x = 1.

$$f'(x) = a(x-1)(x-\alpha)(x-\beta) = a(x-1)\left(x^2-(\alpha+\beta)x+\alpha\beta\right)$$



Here $\frac{\alpha+\beta}{2} = 1$ so $\alpha+\beta = 2$

$$f'(x) = a\left(x^3-3x^2+(\alpha\beta+2)x-\alpha\beta\right)$$

$$f''(2) = 0 \Rightarrow \alpha\beta = -2$$

$\therefore$ Sum of roots of $f'(x) = 0$ is 1 + α + β i.e., 3.

56. (C)

$$f'(x) = a(x-1)\left(x^2-2x-2\right) = a(x-1)\left((x-1)^2-3\right)$$

$$f(x) = a\left(\frac{(x-1)^4}{4} - \frac{3}{2}(x-1)^2\right) + C$$

$$\because f(1) = 0 \text{ so } c = 0;\ f(2) = 1 \text{ so } a = -\frac{4}{5}$$

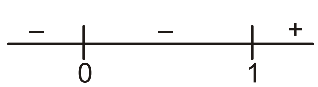
$$f(x) = -\frac{4}{5}\left[\frac{(x-1)^4}{4} - \frac{3}{2}(x-1)^2\right]$$

$$f(3) = \frac{8}{5}$$

57. (D)

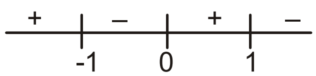
(P) $f(x) = x^{4/3} - 4x^{1/3}$

$$f'(x) = \frac{4}{3}\left(\frac{x-1}{x^{2/3}}\right)$$



(Q) $f(x) = 5x^{2/5} - x^2$

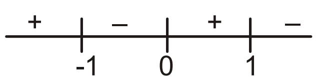
$$f'(x) = 2\left(\frac{1-x^{8/5}}{x^{3/5}}\right) = 2\left(\frac{\left(1-x^{1/5}\right)\left(1+x^{1/5}\right)\left(1+x^{2/5}\right)\left(1+x^{4/5}\right)}{x^{3/5}}\right)$$



(R) $$f(0) = \lim_{x\to 0}\frac{1}{x}\log\left(\frac{e^x-1}{x}\right) = \lim_{x\to 0}\frac{1}{\frac{e^x-1}{x}}\cdot\frac{xe^x-\left(e^x-1\right)}{x^2} = \frac{1}{2}$$

(S) $f(x) = 3x^{2/3} - x^2$

$$f'(x) = 2\left(\frac{1-x^{4/3}}{x^{1/3}}\right) = 2\frac{\left(1-x^{1/3}\right)\left(1+x^{1/3}\right)\left(1+x^{2/3}\right)}{x^{1/3}}$$

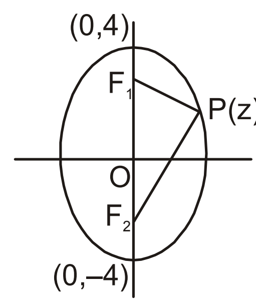


58. (A)

(P) $PF_1 + PF_2 = 8$

$\therefore$ locus of P(z) is an ellipse

$\therefore |z|_{max} = 4$



(Q) $iz^3 + z^2 - z + i = 0$

$\Rightarrow (z^2+i)(iz+1) = 0 \Rightarrow z^2 = -i$ or $z = \frac{-1}{i} = i$ $\quad\therefore |z| = 1$

(R) Let z = x + iy , then $\arg\left(\frac{z-z_1}{z-z_2}\right) = \frac{\pi}{4}$

$$\Rightarrow \tan^{-1}\left(\frac{y-6}{x-10}\right) - \tan^{-1}\left(\frac{y-6}{x-4}\right) = \frac{\pi}{4} \quad \Rightarrow \tan^{-1}\left[\frac{\frac{y-6}{x-10}-\frac{y-6}{x-4}}{1+\frac{y-6}{x-10}\times\frac{y-6}{x-4}}\right] = \frac{\pi}{4}$$

$$\Rightarrow |(x-7)+i(y-9)|^2 = (3\sqrt{2})^2 \quad \Rightarrow |z-(7+9i)| = 3\sqrt{2}$$

(S) $|z_1 - 2z_2|^2 = |2 - z_1\bar{z}_2|^2$

or $|z_1|^2 + 2^2|z_2|^2 - 2\text{Re}(z_1(2\bar{z}_2)) = 2^2 + |z_1|^2|\bar{z}_2|^2 - 2\text{Re}(2z_1\bar{z}_2)$

$(1 - |z_2|^2)(|z_1|^2 - 4) = 0 \qquad \because |z_2| \neq 1 \quad \therefore (|z_1|^2 - 4) = 0$

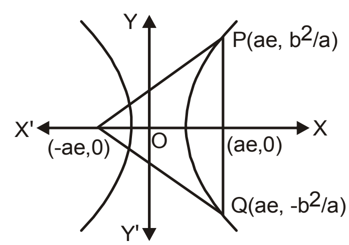
or $|z_1| = 2$

59. (C)

(P) Given curve is (x + 6)(y – 5) = –30 is a rectangular hyperbola.

$\Rightarrow$ e = $\sqrt{2}$

(Q) $\tan 30^\circ = \dfrac{b^2/a}{2ae}$



$\Rightarrow \dfrac{2}{\sqrt{3}}e = e^2 - 1 \Rightarrow \sqrt{3}e^2 - 2e - \sqrt{3} = 0$

$\Rightarrow e = \dfrac{2 \pm \sqrt{4+12}}{2\sqrt{3}} = \dfrac{2 \pm 4}{2\sqrt{3}}$

$\Rightarrow e = \dfrac{3}{\sqrt{3}} = \sqrt{3}$

(R) Eccentricity of the hyperbola = $\dfrac{AB}{PA - PB}$ = $\dfrac{6}{4}$ = $\dfrac{3}{2}$. If eccenticity of conjugate hyperbola is e′

then $\dfrac{1}{\left(\dfrac{3}{2}\right)^2} + \dfrac{1}{e'^2} = 1 \qquad \Rightarrow e' = \dfrac{3}{\sqrt{5}}$.

(S) Angle between the asymptotes is $\tan^{-1}\left|\dfrac{2ab}{a^2 - b^2}\right| = \dfrac{\pi}{3} \Rightarrow \left|\dfrac{2\dfrac{a}{b}}{\dfrac{a^2}{b^2} - 1}\right| = \sqrt{3} \Rightarrow \dfrac{2\sqrt{e'^2 - 1}}{|e'^2 - 2|} = \sqrt{3}$

(where e′ is eccentricity of conjugate hyperbola)

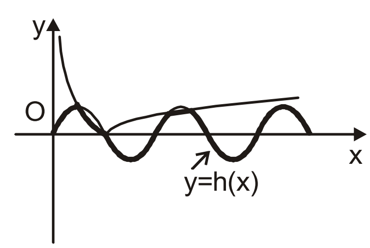
$\Rightarrow e' = 2$

60. (D)

(P) f(x) is not differentiate at x = 0 only.

(Q) g(x) is differentiate in R.

(R) from the graph h(x) is not differentiate at four points.



(S) $\phi'(x) = \dfrac{2 - 5x^2}{3x^{1/3}\sqrt{1 - x^2}}$

So $\phi(x)$ is not differentiate at x = 0, ±1.