



DATE : 01.01.2017

FINAL TEST SERIES JEE -2017 TEST-03

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[PHYSICS]

1. Answer (2)
2. Answer (2)
3. Answer (2)

$$P = \frac{\alpha}{T^2}$$

$$PT^2 = \text{constant}$$

$$P \cdot \left(\frac{PV}{nR}\right)^2 = \text{constant}$$

$$P^3 V^2 = \text{constant}$$

$$PV^{\frac{2}{3}} = \text{constant}$$

$$\gamma = \frac{2}{3}$$

$$B = \gamma P = \frac{2}{3}P$$

4. Answer (1)

$$W_{AB} = nRT \ln\left(\frac{V_2}{V_1}\right) \quad (\text{Temperature during AB is double the temperature during CD})$$

$$= 3R(2T_0) \ln \frac{2V_0}{V_0} = 6RT_0 \ln 2$$

$$U_0 = nC_v T_0$$

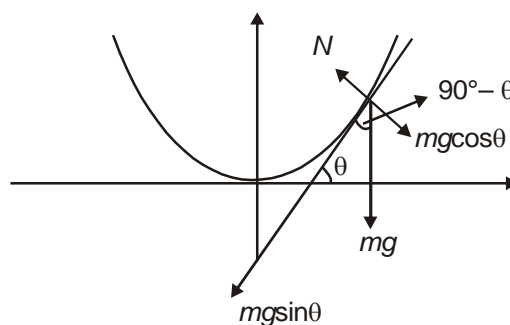
$$U_0 = 3 \times \frac{3R}{2} T_0 \Rightarrow T_0 = \frac{2U_0}{9R}$$

$$\therefore W_{AB} = 6R \cdot \frac{2U_0}{9R} \ln 2 = \frac{4U_0}{3} \ln 2$$

5. Answer (4)
6. Answer (2)

$$\begin{aligned} \Delta U : \Delta W : \Delta Q &= C_v : C_p - C_v : C_p \\ &= \frac{3}{2}R : R : \frac{5R}{2} = 3 : 2 : 5. \end{aligned}$$

7. Answer (4)



$$x^2 = ay \Rightarrow 2x = \frac{ady}{dx} \Rightarrow \frac{dy}{dx} = \frac{2x}{a}$$

$$f_R = mg \sin \theta \cong mg \tan \theta \quad (\theta \text{ is small})$$

$$ma' = mg \cdot \frac{2x}{a}$$

$$\Rightarrow T = 2\pi \sqrt{\frac{a}{2g}}$$

8. Answer (3)

$$f_1 = \frac{400\pi}{2\pi} = 200 \text{ Hz}$$

$$f_2 = \frac{404\pi}{2\pi} = 202 \text{ Hz}$$

$$|f_2 - f_1| = 2 \text{ Hz}$$

$$\frac{I_{\text{max.}}}{I_{\text{min.}}} = \frac{(5+2)^2}{(5-2)^2} = \frac{49}{9}$$

9. Answer (4)

10. Answer (3)

$$v = \sqrt{\frac{B}{\rho}} = \sqrt{\frac{\alpha P}{\rho}}$$

11. Answer (4)

$$f_0 = \frac{v}{4l} = \frac{340 \times 100}{4 \times 17}$$

$$f_0 = 500 \text{ Hz}; 3f_0 = 1500 \text{ Hz}$$

12. Answer (4)

$$f = KT_1^{1/2}; \frac{f}{2} = KT_2^{1/2}$$

$$\Rightarrow \frac{T_2}{T_1} = \frac{1}{4} \Rightarrow \frac{T_2 - T_1}{T_1} = -\frac{3}{4}$$

13. Answer (1)

$$\Delta f = \left(\frac{v}{v-v_s} - \frac{v}{v+v_s} \right) f \cong \frac{2fv_s}{v}$$

14. Answer (3)

15. Answer (2)

$$C = C_v + \frac{P dV}{n dT}$$

$$\frac{P dV}{n dT} = 3aT^2$$

$$\frac{nRT dV}{Vn dT} = T^2$$

$$\frac{dV}{V} = \frac{3aT}{R} dT$$

$$\ln V = \frac{3aT^2}{2R} + C$$

$$\ln V = \ln_e e^{\frac{3aT^2}{2R}} + \ln K$$

$$Ve^{-\frac{3aT^2}{2R}} = \text{constant}$$

16. Answer (1)

Equation of line

$$P = \left(\frac{-P_0}{v_0} \right) v + 3P_0$$

$$T = \frac{1}{nR} \left[\left(\frac{-P_0}{v_0} \right) v^2 + 3P_0 v \right]$$

$$\frac{dT}{dv} = 0 \Rightarrow v = \frac{3v_0}{2}$$

17. Answer (2)

$$PV^{-2} = \text{constant}$$

$$C = C_v + \frac{R}{1-x}; x = -2$$

$$\frac{nR\Delta T}{1-x} = 200$$

$$\frac{nR\Delta T}{3} = 200$$

$$nR\Delta T = 600; \Delta U = nC_v\Delta T = \frac{5R}{2} \times \frac{600}{R} = 1500 \text{ J}$$

18. Answer (2)

$$\frac{K(T_1 - T)}{2} \frac{1}{2e} = \frac{2K(T - T_2)}{e}; \left(e = \frac{l}{A} \right)$$

$$T_1 - T = 8T - 8T_2$$

$$T_1 + 8T_2 = 9T$$

$$T = \frac{T_1 + 8T_2}{9}$$

19. Answer (1)

for **AB**

$$P = KT \Rightarrow V \text{ is constant}$$

for **BC**

$$P = K_1T + P_0$$

$$\Rightarrow V = \frac{nRT}{K_1T + P_0}$$

20. Answer (1)

$$\frac{dx}{dt} = 3 \times 10\pi \cos(10\pi t)$$

$$v_{\max} = 30\pi$$

$$K = \frac{1}{2} \times \frac{1}{\pi^2} \times 900\pi^2 = 450 \text{ J}$$

21. Answer (1)

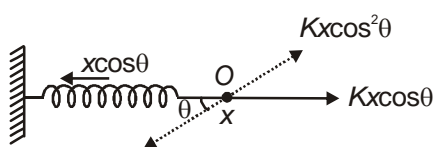
$$P = KT$$

$$dP = KdT$$

$$100 \times \frac{dP}{P} = \frac{dT}{T} \times 100$$

$$T = 100 \text{ K}$$

22. Answer (1)



$$ma = (K \cos^2 \theta)x$$

$$\omega = \sqrt{\frac{K \cos^2 \theta}{m}}$$

23. Answer (3)

24. Answer (3)

25. Answer (3)

$$\frac{\lambda_1}{\lambda_2} = \frac{T_2}{T_1}$$

$$\frac{\lambda_m}{\lambda_2} = \frac{3000}{2000}$$

$$\lambda_2 = \frac{2}{3} \lambda_m$$

26. Answer (4)

27. Answer (2)

28. Answer (1)

29. Answer (1)

30. Answer (1)

[CHEMISTRY]

31. Answer (2)

Final volume of the gas at 600 torr pressure.

$$V_2 = \frac{P_1 V_1}{P_2} = \frac{760 \times 1}{600} = 1.267 \text{ L}$$

or $V_2 = 1267 \text{ mL}$

Volume occupied by gas = volume of vessel - volume occupied by charcoal.

$$= 1000 - \frac{12}{1.8} = 1000 - 6.67 = 993.33 \text{ mL}$$

Difference of volume is due to adsorption by charcoal = $1267 - 993.33 = 273.67 \text{ mL}$

Volume of gas adsorbed per gram of charcoal

$$= \frac{273.67}{12} = 22.80 \text{ mL/g}$$

32. Answer (1)

$$\text{Area of the triangle} = \frac{\sqrt{3}}{4} a^2$$

$$\text{Radius } r = \frac{a}{2}$$

$$\therefore \text{Area of circle} = \pi r^2 = \frac{\pi}{4} a^2$$

$$\text{Hence percentage occupied} = \frac{\frac{1}{2} \times \frac{\pi}{4} a^2}{\frac{\sqrt{3}}{4} a^2} \times 100$$

$$= \frac{\pi}{2\sqrt{3}} \times 100 = \frac{3.14}{2 \times 1.732} \times 100 = 90.64\%$$

$$\therefore \text{Percentage of free space} = (100 - 90.64) = 9.36\%$$

33. Answer (1)

$$[H^+] = C\alpha$$

$$\Rightarrow 10^{-5} = 10^{-4}\alpha$$

$$\Rightarrow \alpha = 0.1$$

$$i = 1 + (n - 1)\alpha$$

$$\Rightarrow i = 1.1$$

$$\Delta T_b = 1.1 \times 0.52 \times 10^{-4}$$

$$= 5.72 \times 10^{-5}$$

34. Answer (1)

$$(\text{mol L}^{-1})^{1-n} \text{ s}^{-1} = (\text{mol L}^{-1})^{-1} \text{ s}^{-1}$$

$$1 - n = -1$$

$$\Rightarrow n = 2$$

As order of overall reaction is 2 and order w.r.t [A] is 1.

Hence, order w.r.t. [B] will also be 1.

35. Answer (3)

$$\text{Conc. of NaCl} = \frac{0.1}{2} \text{ N} = 0.05 \text{ N}$$

$$\lambda_{\text{eq}} = \frac{\sigma \times 1000}{\text{N}}$$

$$\Rightarrow \lambda_{\text{eq}} = \frac{0.0055 \times 1000}{0.05} = \frac{5.5}{0.05} = \frac{550}{5}$$

$$= 110 \text{ S cm}^2 \text{ equivalent}^{-1}$$

36. Answer (2)

$$E_{\text{MnO}_4^-/\text{Mn}^{2+}} = E^\circ_{\text{MnO}_4^-/\text{Mn}^{2+}} - \frac{0.0591}{5}$$

$$\log \frac{[\text{Mn}^{2+}]}{[\text{MnO}_4^-][\text{H}^+]^8}$$

$$= 1.51 - \frac{0.0591}{5} \times 8(\text{pH})$$

$$= 1.321 \text{ V}$$

37. Answer (3)

$$\frac{5}{342} = \frac{1}{X}$$

$$\Rightarrow X = \frac{342}{5} = 68.4 \text{ g/mole}$$

38. Answer (3)

$$\text{O} = \text{N}$$

$$\text{Ti} = \frac{\text{N}}{2}$$

$$\text{hence formula} = \text{TiO}_2$$

$$\text{Percentage of Ti} = \frac{48}{80} \times 100 = 60\%$$

39. Answer (4)

$$\text{Loss in mass of solution} \propto P_s$$

$$\text{Loss in mass of solvent} \propto P_0 + P_s$$

$$\frac{\text{loss in mass of solvent}}{\text{loss in mass of solution}} = \frac{P_0 + P_s}{P_s} = \frac{n_B}{n_A}$$

$$\Rightarrow \frac{0.04}{2.5} = \frac{5 \times 18}{M \times 80}$$

$$\Rightarrow M = \frac{5 \times 18}{80} \times \frac{2.5}{0.04} = \frac{90 \times 2.5}{80 \times 0.04} = 70.31 \text{ g/mole}$$

40. Answer (3)

$$\text{For ClCH}_2\text{COOH} \quad n = 2$$

$$i = 1 + (n - 1)\alpha = 1.4$$

41. Answer (1)

$$t_{1/2} \propto \frac{1}{[P_0]^{n-1}}$$

42. Answer (3)

$$X = \frac{1}{8} \times 8 = 1 \quad (\text{Corners})$$

$$Y = 1 \quad (\text{Body center})$$

43. Answer (2)

$$\Delta T_f = iK_f \times m$$

$$\text{Also } \Delta T_b = iK_b \times m$$

$$\frac{\Delta T_f}{\Delta T_b} = \frac{K_f}{K_b}$$

$$\Rightarrow \frac{0.186}{\Delta T_b} = \frac{1.86}{0.512}$$

$$\Rightarrow \Delta T_b = \frac{0.186 \times 0.512}{1.86}$$

$$= 0.0512 \text{ K}$$

44. Answer (1)

$$\text{Weight of Cu} = 100 \times 10^{-2} \times 8.94 \text{ g} = 8.94 \text{ g}$$

$$W = ZQ \text{ (according to Faraday's first law)}$$

$$\Rightarrow W = \frac{M}{96500 \times 2} \times Q$$

$$\Rightarrow Q = \frac{8.94 \times 2 \times 96500}{63.5} = 2.71 \times 10^4 \text{ C}$$

45. Answer (4)

46. Answer (2)

47. Answer (2)

Spinel structure is AB_2O_4 typein which O^{2-} forms FCC

$$\text{A}^{2+} \text{ occupies } \frac{1}{8} \text{ of the tetrahedral voids}$$

$$\text{B}^{3+} \text{ occupies } \frac{1}{2} \text{ of the octahedral voids}$$

48. Answer (3)

In both the experiments pH is kept constant

$$\text{hence } -\frac{d[A]}{dt} = K[A]^x$$

Given half life is independent of [A] hence $x = 1$

also
$$K = \frac{0.693}{t_{1/2}}$$

$$\frac{(t_{1/2})_1}{(t_{1/2})_2} = \left(\frac{H_1^+}{H_1^+} \right)$$

$$\Rightarrow n = 2$$

$$\therefore \text{Overall order} = 1 + 2 = 3$$

49. Answer (1)

50. Answer (3)

$$W = \frac{M \times l \times t}{96500 \times n\text{-factor}}$$

$$\Rightarrow 11.67 = \frac{93 \times l \times 3600}{96500 \times 6}$$

$$\Rightarrow l = \frac{11.67 \times 96500 \times 6}{3600 \times 93} \text{ ampere hour} = 20.18$$

ampere hours

$$\begin{aligned} \Rightarrow \text{Current efficiency} &= \frac{20.18}{25.6} \times 100 \\ &= 78.83\% \end{aligned}$$

51. Answer (2)

$$K_b = \frac{MRT_0^2}{100\Delta H_{\text{vap}}} \quad (\text{C}_6\text{H}_5\text{CH}_3)$$

$$\Delta H_{\text{vap}} = \frac{92 \times 8.314 \times (383.7)^2}{1000 \times 3.32} = 33.92 \text{ kJ}$$

52. Answer (3)

$$A = 7 \times \frac{1}{8} = \frac{7}{8} \quad (\text{Corners})$$

$$B = 6 \times \frac{1}{2} = 3 \quad (\text{Face centres})$$

$$A : B = \frac{7}{8} : 3 = 7 : 24$$

$$A_7 B_{24}$$

53. Answer (2)

54. Answer (1)

$$\begin{aligned} P_S &= \left(5 \times \frac{2}{5} \right) + \left(10 \times \frac{3}{5} \right) \\ &= 2 + 6 = 8 \end{aligned}$$

55. Answer (2)

56. Answer (2)

57. Answer (1)

58. Answer (1)

59. Answer (4)

60. Answer (1)

[MATHEMATICS]

61. Answer (4)

In any triangle, four circles can be drawn touching all the three sides of triangle. But in this case, the three lines are concurrent.

62. Answer (2)

$$\text{Vertices} \equiv \left(0, -\frac{n}{m} \right), \left(-\frac{n}{l}, 0 \right), \left(0, \frac{n}{m} \right) \text{ and } \left(\frac{n}{l}, 0 \right).$$

$$\text{Hence, the area is } \frac{1}{2} \times \frac{2n}{m} \times \frac{2n}{l} = 2.$$

$$r^2 = lm$$

$$\Rightarrow l, n, m \text{ are in G.P.}$$

63. Answer (1)

Let focus be (a, b) .

Equations are

$$S_1 : (x - a)^2 + (y - b)^2 = x^2$$

$$S_2 : (x - a)^2 + (y - b)^2 = y^2$$

$$\text{Common chord} \equiv S_1 - S_2 = 0, x^2 - y^2 = 0$$

$$\Rightarrow x = \pm y.$$

64. Answer (2)

Let (x, y) be the other end of the chord.

$$\frac{x+0}{2} = 2a, \frac{y+0}{2} = 3b \Rightarrow x = 4a, y = 6b.$$

$(4a, 6b)$ lies on the parabola.

$$\Rightarrow 36b^2 = 4(4a)$$

$$\Rightarrow 9b^2 = 4a.$$

65. Answer (1)

$$\text{Mid-point of the chord is } \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

$$T = S_1 \Rightarrow \frac{x}{x_1 + x_2} + \frac{y}{y_1 + y_2} = 1$$

66. Answer (4)

$$\text{As } x \rightarrow 0$$

$$\tan x \rightarrow 0$$

$$\cot x \rightarrow \infty$$

$$\Rightarrow \lim_{x \rightarrow 0} (1 + \tan x)^{\cot x} = e^{\lim_{x \rightarrow 0} \tan x \cdot \cot x} = e$$

67. (3) Let the eccentric angle of point 'P' be θ , then equation of tangent and normal at point are

$$\frac{x}{6} \cos \theta + \frac{y}{3} \sin \theta = 1$$

$$\text{and } \frac{6x}{\cos \theta} - \frac{3y}{\sin \theta} = 27$$

$$\text{Thus, } A \equiv \left(0, \frac{3}{\sin \theta} \right)$$

and $B \equiv \left(\frac{27}{6} \cos \theta, 0 \right)$

Area of ΔOAB

$$= \frac{1}{2} \cdot \frac{3}{\sin \theta} \cdot \frac{27}{6} \cdot \cos \theta = \frac{27}{4} \quad (\text{given})$$

$$\Rightarrow \cot \theta = 1 \Rightarrow \theta = \frac{\pi}{4}, \frac{5\pi}{4}$$

68. Answer (3)

Case(i) $x > 0$ Case(ii) $x < 0$

$$\frac{2}{3} < x \qquad x < \frac{2}{3}$$

$$\Rightarrow x < 0$$

Hence from case (i) & (ii),

$$x \in (-\infty, 0) \cup \left(\frac{2}{3}, \infty \right)$$

69. Answer (3)

$$\begin{vmatrix} 5 & 10 & 7 \\ 1 & 2 & 3 \\ 2 & 2 & -2 \end{vmatrix} = 16 \neq 0. \text{ Hence skew.}$$

70. Answer (2)

$$\lim_{n \rightarrow \infty} \frac{n(n+1)}{2(n+2)(2n+3)}$$

$$\lim_{n \rightarrow \infty} \frac{n^2 \left[1 + \frac{1}{n} \right]}{2n^2 \left[1 + \frac{2}{n} \right] \left[2 + \frac{3}{n} \right]} = \frac{1}{2(1)(2)} = \frac{1}{4}$$

71. (1) (Let the tangent be

$$S_1 = (ae, 0), S_2 = (-ae, 0)$$

$$xb \cos \theta + ay \sin \theta - ab = 0$$

$$\Rightarrow \cot \theta = 1 \Rightarrow \theta = \frac{\pi}{4}, \frac{5\pi}{4}$$

Similarly, $S_2P_2 = \frac{ab(1+e \cos \theta)}{\sqrt{b^2 \cos^2 \theta + a^2 \sin^2 \theta}}$

$$\Rightarrow S_1P_1 \cdot S_2P_2 = \frac{a^2 b^2 (1 - e^2 \cos^2 \theta)}{b^2 \cos^2 \theta + a^2 \sin^2 \theta}$$

$$= \frac{a^2 b^2 (1 - e^2 \cos^2 \theta)}{a^2 + (b^2 - a^2) \cos^2 \theta}$$

$$= \frac{a^2 b^2 (1 - e^2 \cos^2 \theta)}{a^2 - a^2 e^2 \cos^2 \theta} = b^2$$

Which is clearly a constant.

$$\text{Thus, } (S_1P_1) (S_2P_2) = 9$$

72. Answer (1)

$$1^2 + b^2 = a^2 + 1^2 \quad (\text{equilateral triangle})$$

$$\Rightarrow a = \pm b$$

$a = -b$ rejected.

Also area of triangle = $\sqrt{3}a$.

73. Answer (3)

If they touch $x = y$ is a tangent to both the circles.

$$\Rightarrow -\frac{2}{\sqrt{2}} = \sqrt{4-c} \Rightarrow 4-c=2 \Rightarrow \boxed{c=2}$$

74. Answer (3)

$$x = a \left(y^2 + \frac{b}{a}y + \frac{b^2}{4a^2} \right) - \frac{b^2}{4a} + c$$

$$\text{or } a \left(y + \frac{b}{2a} \right)^2 = x + \frac{b^2}{4a} - c$$

$$\Rightarrow \left(y + \frac{b}{2a} \right)^2 = \frac{1}{a} \left(x + \left(\frac{b^2}{4a} - c \right) \right)$$

$$\text{Hence L.R.} = \frac{1}{a}$$

75. Answer (4)

$$2 - \lambda > 0, \lambda - 5 > 0$$

$$\Rightarrow \lambda < 2 \text{ and } \lambda > 5 \Rightarrow \lambda \in \phi$$

76. Answer (3)

Equation of the normal at the point $(9m^2, -18m)$

(for $a = 9$) to the parabola $y^2 = 4(9x)$ is

$$y = mx - 2(9m) - 9m^3$$

$$\Rightarrow m = -\frac{2}{3} \text{ or } 0$$

For $m = -\frac{2}{3}$ the normal is $2x + 3y = 44$.

77. Answer (3)

Equation of plane parallel to x-axis be

$$ax + by + cz + d = 0$$

Since normal to the plane is perpendicular to x-axis

$$a \cdot 1 + b \cdot 0 + c \cdot 0 = 0 \Rightarrow a = 0$$

So that required equation is $by + cz + d = 0$

where $b, c \neq 0$.

78. Answer (2)

Equation of plane

$$\frac{x}{20} + \frac{y}{15} + \frac{z}{-12} = 1$$

It meets coordinate axis in points.

$$A(20, 0, 0), B(0, 15, 0), C(0, 0, -12)$$

$$\therefore \text{Volume} = \frac{1}{6} |20 \times 15 \times (-12)| = 600 \text{ cubic units}$$

79. Answer (3)

$$\lim_{x \rightarrow \infty} \left(1 - \frac{5}{x+2}\right)^x = e^{\lim_{x \rightarrow \infty} \left(\frac{-5}{x+2}\right)x} = e^{-5}$$

80. Answer (2)

$$\text{Let } y = \cos \frac{x}{2} \cos \frac{x}{4} \dots \cos \frac{x}{2^n}$$

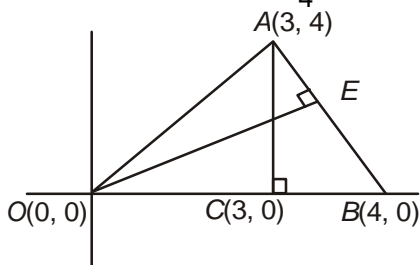
$$= \frac{1}{2 \sin \frac{x}{2^n}} \left(\cos \frac{x}{2} \cos \frac{x}{4} \dots \cos \frac{x}{2^{n-2}} \sin \frac{x}{2^{n-2}} \right)$$

$$= \frac{\sin x}{2^n \sin \frac{x}{2^n}}$$

$$\lim_{n \rightarrow \infty} y = \lim_{n \rightarrow \infty} \frac{\frac{x}{2^n}}{\sin \frac{x}{2^n}} \cdot \frac{\sin x}{x} = 1 \cdot \frac{\sin x}{x} = \frac{\sin x}{x}$$

81. Answer (3)

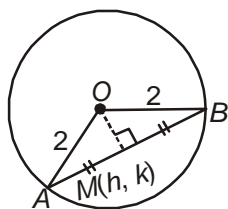
Equation of altitude OE is $y = \frac{x}{4}$



Solving AC and OE, point of intersection comes out

to be $\left(3, \frac{3}{4}\right)$.

82. Answer (3)



$$AM = MB = OM$$

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

$$\Rightarrow h^2 + k^2 = 2$$

Hence locus of (h, k) is $x^2 + y^2 = 2$.

83. Answer (3)

For given slope, there exist 2 parallel tangents to ellipse. Hence, there are 2 values of C.

84. (2) Given parabola are :

$$y^2 = 4ax \quad \dots(i)$$

$$\text{and } y_2 = 4c(x - b) \quad \dots(ii)$$

Equation of any normal to parabola (i) may be taken as

$$y - 2at = -t(x - at^2)$$

$$\text{or } lx + y - (2at + at^3) = 0 \quad \dots(iii)$$

Equation of any normal to parabola (ii) may be taken as

$$y - 2c\lambda = -\lambda(x - at^2)$$

$$\text{or } tx + y - (2c\lambda + b\lambda + c\lambda^3) = 0 \quad \dots(iv)$$

Equation (iii) and (iv) must be identical.

$$\therefore \frac{t}{\lambda} = \frac{1}{1} = \frac{2at + at^3}{2c\lambda + b\lambda + c\lambda^3}$$

$$\therefore t = \lambda \text{ and } 2c\lambda + b\lambda + c\lambda^3 = cat + at^3$$

$$\Rightarrow (c - a)t^3 + 2(c - a)t + bt = 0$$

$$\Rightarrow t[c - a)t^2 + 2c - 2a + b] = 0$$

$$\Rightarrow t = 0, t = \pm \sqrt{\frac{2a - 2c - b}{c - a}}$$

$$= \pm \sqrt{\frac{b}{c - a}} - 2$$

For common normal to the two parabolas (i) and (ii) other than their axis,

$$\frac{b}{a - c} - 2 > 0 \text{ or } \frac{b}{a - c} > 2$$

85. Answer (1)

$$\lim_{x \rightarrow 0} \frac{2^x \log 2}{\frac{1}{2}(1+x)^{-1/2}} = 2 \log 2$$

86. Answer (1)

Both statements are correct.

$$\frac{\alpha - \lambda - 2}{2} = \frac{\beta - \lambda}{-1} = \frac{-2(2\lambda + 4 - \lambda - 5)}{5} \text{ gives}$$

$$\alpha = \frac{\lambda + 14}{5}, \beta = \frac{7\lambda - 2}{5}$$

$$\Rightarrow \text{Locus} \rightarrow 7x - y = 20$$

87. Answer (1)

88. Answer (4)

89. (2) For ellipse $\frac{x^2}{27} - \frac{y^2}{27} = 1$,

$$\frac{x^2}{12} - \frac{y^2}{4} = 1,$$

$$e\sqrt{1 - \frac{16}{25}} = \frac{3}{5}$$

and

The foci are $(\pm 3, 0)$.

For hyperbola $\frac{x^2}{27} - \frac{y^2}{27} = 1$, $e = \sqrt{1 + \frac{12}{4}} = 2$

$$\frac{x^2}{12} - \frac{y^2}{4} = 1,$$

and $a = \frac{3}{2}$

The foci are $(\pm 3, 0)$

Therefore, the two conics are confocal.

Hence, curves are orthogonal.

90. Answer (1)

