DIRECTORATE OF SCHOOL EDUCATION TAMILNADU

12JPCM11 (2023-24)	JEE PRACTICE QUESTIONS (TEST-11)	Class : XII Time : 1.15 hrs Total Marks : 180

Answer key

12th – MATHS

31. Ans: C)

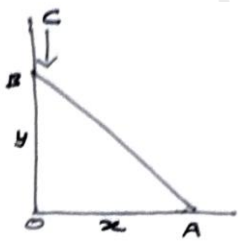
OC – wall

AB – Ladder

OA = x, OB = y, AB = 20*ft*

$x^2 + y^2 = 20^2$

$$2x\frac{dx}{dt} + 2y.\frac{dy}{dt} = 0$$



$$\frac{dy}{dt} = \frac{-x}{\sqrt{400 - x^2}}\frac{dx}{dt}$$

$$= \frac{-16}{\sqrt{400 - 16^2}}\frac{dx}{dt}$$

$$\frac{dy}{dt} = \frac{-4}{3}.\frac{dx}{dt}$$

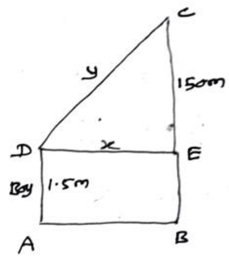
-ve sign indicates, y decreases.

32. Ans: B)

C – Kite position

BC = 151.5 m

CE = BC – BE = 150m



$y^2 = x^2 + 150^2$

$$\frac{dy}{dt} = \frac{x}{y}\frac{dx}{dt}$$

$$= \frac{x}{y}(10)$$

$$= \frac{10\sqrt{y^2 - 150^2}}{y}$$

$$= \frac{10\sqrt{(250)^2 - (150)^2}}{250} = 8 \, m/s$$

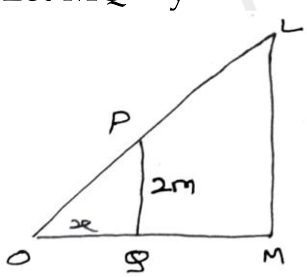
33. Ans: B)

L - Lamp

PQ – Man

OQ = x (shadow)

Let MQ = y



$\frac{dy}{dt} =$ speed of man = 3m/s

ΔOPQ and ΔOLM are similar

$$\frac{OM}{OQ} = \frac{LM}{PQ}$$

$$\frac{x+y}{x} = \frac{5}{2}$$

$$y = \frac{3}{2}x$$

$$\frac{dy}{dt} = \frac{3}{2}\frac{dx}{dt}$$

$$3 = \frac{3}{2}\frac{dx}{dt}$$

$$\frac{dx}{dt} = 2\,{}^{m}\!/\!_{s}$$

34. Ans: B)

r = base radius

l = slant height

h = height

$$l^2 = r^2 + h^2,\ \ h = \frac{l}{\sqrt{2}},\ \ r = \frac{l}{\sqrt{2}}$$

$$V = \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi\left(\frac{l}{\sqrt{2}}\right)^2\left(\frac{l}{\sqrt{2}}\right) = \frac{\pi}{6\sqrt{2}}l^3$$

$$\frac{dV}{dt} = \frac{3\pi}{6\sqrt{2}}(l^2)\frac{dl}{dt}$$

$$2 = \frac{3\pi}{6\sqrt{2}}(4)^2\frac{dl}{dt}$$

$$\frac{dl}{dt} = \frac{\sqrt{2}}{4\pi}\,{}^{cm}\!/\!_{s}$$

$$\lambda = \frac{\sqrt{2}}{4\pi}$$

$$40\pi\sqrt{2}\lambda = 40\pi\sqrt{2}\left(\frac{\sqrt{2}}{4\pi}\right) = 10\times 2 = 20$$

35. Ans: B)

$$f^1(x) = \left[\frac{\sqrt{a+4}}{1-a} - 1\right](5x^4 - 3) < 0$$

$$\left[\frac{\sqrt{a+4}}{1-a} - 1\right]x^4 < \frac{3}{5}$$

$$\left[\frac{\sqrt{a+4}}{1-a} - 1\right] \le 0$$

$$\frac{\sqrt{a+4}}{1-a} \le 1\ [\because -4 \le a < 1] \qquad \rightarrow (1)$$

$$a + 4 \le (1-a)^2$$

$$a^2 - 3a - 3 \ge 0$$

$$a \in \left(-\infty, \frac{3-\sqrt{21}}{2}\right] \cup \left[\frac{3+\sqrt{21}}{2}, \infty\right]$$

But $-4 \le a < 1$

$a \in \left[-4, \frac{3-\sqrt{21}}{2}\right]$ and a > 1, (1) always true

Hence $a \in \left[-4, \frac{3-\sqrt{21}}{4}\right] \cup [1, \infty)$

36. Ans: B)

$f^1(x) = (ab - b^2 + 2) + \cos^4 x + \sin^4 x < 0$

$= ab - b^2 - 2 + (\sin^2 x + \cos^2 x)^2 - 2\sin^2 x\cos^2 x < 0$

$ab - b^2 - 1 < \frac{1}{2}(\sin^2 2x) < \frac{1}{2}$

$2ab - 2b^2 - 2 < 1$

$2b^2 - 2ab + 3 > 0$

$(-2a)^2 - 4.2.3. < 0$

$a^2 < 6$

$-\sqrt{6} < a < \sqrt{6}$

37. Ans: B)

Since $\sin^{-1}(\sin x + \cos x)^3$ and $(\sin x + \cos x)^3$ are both increasing function, *f(x)* is increasing when $\sin x + \cos x$ in increasing

Let $g(x) = \sin x + \cos x$

$g^1(x) = \cos x - \sin x = \sqrt{2}\cos(x + \frac{\pi}{4}) > 0$

(or)

$\cos\left(x + \frac{\pi}{4}\right) > 0$

$2n\pi - \frac{\pi}{2} < x + \frac{\pi}{4} < 2n\pi + \frac{\pi}{2}., n \in I$

$2n\pi - \frac{3\pi}{4} < x < 2n\pi + \frac{\pi}{4}$

$-\frac{3\pi}{4} < x < \frac{\pi}{4}$ *and* $\frac{5\pi}{4} < x < \frac{9\pi}{4}$

But

$x \in (0, 2\pi)$

$x \in \left(0, \frac{\pi}{4}\right) \cup \left(\frac{5\pi}{4}, 2\pi\right)$

Then a = 0, b = 1, c = 5, d = 8

$\therefore$ a + 10b + 100 c + 1000d = 8510

38. Ans: B)

$$f^1(x) = 3\left[1 - \frac{\sqrt{21+4b-b^2}}{b+1}\right]x^2 + 5 > 0$$

$$1 - \frac{\sqrt{21+4b-b^2}}{b+1} \geq 0$$

$$\frac{\sqrt{21+4b-b^2}}{b+1} \leq 1 \qquad \rightarrow (1)$$

$$21 - 4b - b^2 \geq 0 \Rightarrow -7 \leq b \leq 3 \qquad \rightarrow (2)$$

Case I : If b + 1 < 0, b < -1 $\rightarrow$ (3)

Then Inequality (2) is always true, then from (2) and (3) we get

-7 ≤ b < - 1 $\rightarrow$ (4)

Case II : If b + 1 > 0, b > – 1 $\rightarrow$ (5)

Form (1)

$$\sqrt{21-4b-b^2} \leq b+1$$

21 – 4b – b^2 ≤ b^2 + 2b + 1

(b + 5) (b – 2) ≥ 0

$$b \in (-\infty, -5) \cup (2, \infty) \qquad \rightarrow (6)$$

Form (5) , (6) we get b ≥ 2 $\rightarrow$ (7)

From (4), (7) we get

$$b \in [-7, -1] \cup [2, \infty]$$

39. Ans: C)

$$\lim_{x\to\alpha} \frac{1-\cos(ax^2+bx+c)}{(x-\alpha)^2} = \lim_{x\to\alpha} \frac{1-\cos[a(x-\alpha)](x-\beta)}{(x-\alpha)^2}$$

$$\lim_{x\to\alpha} \frac{2\sin^2\left(\frac{a(x-\alpha)(x-\beta)}{2}\right)}{(x-\alpha)^2}$$

$$\lim_{x\to\alpha} \frac{2\sin^2\left(\frac{a(x-\alpha)(x-\beta)}{2}\right)}{\frac{a^2(x-\alpha)^2(x-\beta)^2}{4}} \times \frac{a^2(x-\beta)^2}{4}$$

$$= \frac{a^2(\alpha-\beta)^2}{2}$$

40. Ans: C)

$$\lim_{x\to 0}\frac{x(1+a\cos x)-bsinx}{x^3}=1$$

$$\lim_{x\to 0}\frac{(1+a\cos x)-b\frac{\sin x}{x}}{x^2}=1$$

$$\lim_{x\to 0}\frac{[1+a(1-\frac{x^2}{2!}+\frac{x^4}{4!}....)]....-b(1-\frac{x^2}{3!}+\frac{x^4}{5!}.......)}{x^2}=1$$

$$\lim_{x\to 0}\frac{(1+a-b)+\left(\frac{b}{3!}-\frac{a}{2!}\right)x^2+\therefore}{x^2}=1$$

It is possible only when (1 + a – b) = 0

$$\frac{b}{3!}-\frac{a}{2!}=1$$

On solving we get = $a=\frac{-5}{2},\ b=\frac{-3}{2}$

41. Ans: C)

$$\lim_{x\to\infty}\frac{729^x-243^x-81^x+9^x+3^x-1}{x^3}$$

$$\lim_{x\to\infty}\frac{243^x(3^x-1)-9^x(9^x-1)+(3^x-1)}{x^3}$$

$$\lim_{x\to\infty}\frac{243^x(3^x-1)-9^x(3^x-1)+(3^x+1)+(3^x-1)}{x^3}$$

$$\lim_{x\to\infty}\frac{[243^x-9^x(3^x+1)+1](3^x-1)}{x^3}$$

$$\lim_{x\to\infty}\left(\frac{27^x-1}{x}\right)\left(\frac{9^x-1}{x}\right)\left(\frac{3^x-1}{x}\right)$$

log 27. log 9. log 3

= 6[log 3]^3

$\therefore$K = 6, M = 3, N = 3

$\therefore$KM + MN + NK = $\frac{(K+M+N)^2-(K^2+M^2+N^2)}{2}=45$

42. Ans: C)

$$\lim_{x\to 1}\frac{x+x^2+....+x^n-n}{x-1}$$

$$=\lim_{x\to 1}\left[\frac{x+x^2+....+x^n-1-1-1.....-1}{x-1}\right]$$

$$=\lim_{x\to 1}\left[\frac{(x-1)+(x^2-1)+(x^3-1)+.....+(x^n-1)}{x-1}\right]$$

$$=\lim_{x\to 1}\left[1+(x+1)+(x^2+x+1)+.....\right]$$

$$=1+2+3+.......+n=\frac{n(n+1)}{2}$$

43. Ans: B)

For $x > o$

$Sin\ x < x$

$$\frac{\sin x}{x} < 1$$

$$\frac{99\sin x}{x} > 99$$

$$\left[\frac{99\sin x}{x}\right] = 98$$

$$\frac{x}{\sin x} > 1$$

$$\frac{100x}{\sin x} > 100$$

$$\left[\frac{100x}{\sin x}\right] = 100$$

$$\therefore \lim_{x\to o}+\left[\frac{100x}{\sin x}\right]+\left[\frac{99\sin x}{x}\right]=100+98=198$$

44. Ans: B)

$y^2 - 4y + 11 = (y-2)^2 + 7$

$min\ (y^2\ - 4y + 11) = 7$ (*min is at* $y = 2$)

$$\lim_{x\to o}\left[\min(y^2-4y+11)\frac{\sin x}{x}\right]$$

$$\lim_{x\to o}\left[7\frac{\sin x}{x}\right]$$

For $x > o$

$sin\ x < x$

$$\frac{\sin x}{x} < 1$$

$$\frac{7\sin x}{x} < 7$$

For $x < o$

$sin\ x > x$

$$\frac{\sin x}{x} < 1$$

$$\frac{7\sin x}{x} < 7$$

$$\left[\frac{7\sin x}{x}\right] = 6$$

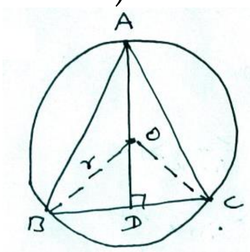
$\therefore RHL = 6$

$$\left[\frac{7\sin x}{x}\right] = 6$$

LHL = 6

LHL = RHL = 6

45. Ans: C)



$AD = h$

$OD - h - r$

$BC< = 2\ DC = 2\ \sqrt{r^2-(r-h)^2} = 2\sqrt{2hr-h^2}$

$$Area\ \Delta\ = \frac{1}{2}(BC)h = \frac{1}{2}(2\sqrt{2hr-h^2})h$$

$h^{3/2}\sqrt{2r-h}$

$AB = AC = \sqrt{h^2+(DC)^2} = \sqrt{h^2+r^2-(h-r)^2}$

$= \sqrt{2hr}$

þ = AB + BC + CA = $= \sqrt{2hr} + 2\sqrt{2hr-h^2}$

$= 2h^{1/2}\left(\sqrt{2r}+\sqrt{2r-h}\right)$

$$\therefore \lim_{h \to 0}\frac{\Delta}{P^3} = \lim_{h \to 0}\frac{h^{3/2}\sqrt{2r-h}}{8h^{3/2}(\sqrt{2r}+\sqrt{2r-h})^3} = \frac{\sqrt{2}r}{8\left(2\sqrt{2r}\right)^3} = \frac{1}{128\ r}$$

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11JPCM11 (2023-24)	JEE PRACTICE QUESTIONS (TEST-11)	Class : XI Time : 1.15 hrs Total Marks : 180

Answer key

11th – MATHS

31. Ans: C)

$$\lim_{x\to\alpha}\frac{1-\cos(ax^2+bx+c)}{(x-\alpha)^2}=\lim_{x\to\alpha}\frac{1-\cos[a(x-\alpha)](x-\beta)}{(x-\alpha)^2}$$

$$\lim_{x\to\alpha}\frac{2\sin^2\left(\frac{a(x-\alpha)(x-\beta)}{2}\right)}{(x-\alpha)^2}$$

$$\lim_{x\to\alpha}\frac{2\sin^2\left(\frac{a(x-\alpha)(x-\beta)}{2}\right)}{\frac{a^2(x-\alpha)^2(x-\beta)^2}{4}}\times\frac{a^2(x-\beta)^2}{4}$$

$$=\frac{a^2(\alpha-\beta)^2}{2}$$

32. Ans: C)

$$\lim_{x\to0}\frac{x(1+a\cos x)-bsinx}{x^3}=1$$

$$\lim_{x\to0}\frac{(1+a\cos x)-b\frac{\sin x}{x}}{x^2}=1$$

$$\lim_{x\to0}\frac{[1+a(1-\frac{x^2}{2!}+\frac{x^4}{4!}....)]....-b(1-\frac{x^2}{3!}+\frac{x^4}{5!}.......)}{x^2}=1$$

$$\lim_{x\to0}\frac{(1+a-b)+\left(\frac{b}{3!}-\frac{a}{2!}\right)x^2+\therefore}{x^2}=1$$

It is possible only when (1 + a – b) = 0

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$$\lim_{x\to\infty}\frac{243^x(3^x-1)-9^x(9^x-1)+(3^x-1)}{x^3}$$

$$\lim_{x\to\infty}\frac{243^x(3^x-1)-9^x(3^x-1)+(3^x+1)+(3^x-1)}{x^3}$$

$$\lim_{x\to\infty}\frac{[243^x-9^x(3^x+1)+1](3^x-1)}{x^3}$$

$$\lim_{x\to\infty}\left(\frac{27^x-1}{x}\right)\left(\frac{9^x-1}{x}\right)\left(\frac{3^x-1}{x}\right)$$

log 27. log 9. log 3

= 6[log 3]^3

$\therefore$ K = 6, M = 3, N = 3

$\therefore$ KM + MN + NK = $\frac{(K+M+N)^2-(K^2+M^2+N^2)}{2}=45$

34. Ans: C)

$$\lim_{x\to1}\frac{x+x^2+....+x^n-n}{x-1}$$

$$=\lim_{x\to1}\left[\frac{x+x^2+....+x^n-1-1-1.....-1}{x-1}\right]$$

$$=\lim_{x\to1}\left[\frac{(x-1)+(x^2-1)+(x^3-1)+.....+(x^n-1)}{x-1}\right]$$

$$=\lim_{x\to1}\left[1+(x+1)+(x^2+x+1)+.....\right]$$

$$=1+2+3+.......+n=\frac{n(n+1)}{2}$$

35. Ans: B)

For $x>o$

$Sin\ x < x$

$\frac{\sin x}{x} < 1$

$\frac{99\sin x}{x} > 99$

$\left[\frac{99\sin x}{x}\right] = 98$

$\frac{x}{\sin x} > 1$

$\frac{100x}{\sin x} > 100$

$\left[\frac{100x}{\sin x}\right] = 100$

$\therefore \lim_{x \to o} + \left[\frac{100x}{\sin x}\right] + \left[\frac{99\sin x}{x}\right] = 100 + 98 = 198$

36. Ans: B)

$y^2 - 4y + 11 = (y-2)^2 + 7$

$min\ (y^2 - 4y + 11) = 7\ (min\ is\ at\ y = 2)$

$\lim_{x \to o}\left[\min(y^2 - 4y + 11)\frac{\sin x}{x}\right]$

$\lim_{x \to o}\left[7\frac{\sin x}{x}\right]$

For $x > o$

$sin\ x < x$

$\frac{\sin x}{x} < 1$

$\frac{7\sin x}{x} < 7$

$\left[\frac{7\sin x}{x}\right] = 6$

$\therefore RHL = 6$

For $x < o$

$sin\ x > x$

$\frac{\sin x}{x} < 1$

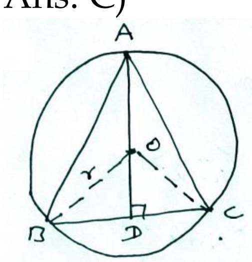
$\frac{7\sin x}{x} < 7$

$\left[\frac{7\sin x}{x}\right] = 6$

LHL = 6

LHL = RHL = 6

37. Ans: C)



$AD = h$

$OD - h - r$

$BC <= 2\ DC = 2\ \sqrt{r^2 - (r-h)^2} = 2\sqrt{2hr - h^2}$

$$Area\,\Delta = \frac{1}{2}(BC)h = \frac{1}{2}(2\sqrt{2hr-h^2})h$$

$$h^{3/2}\sqrt{2r-h}$$

$$AB = AC = \sqrt{h^2+(DC)^2} = \sqrt{h^2+r^2-(h-r)^2}$$

$$= \sqrt{2hr}$$

þ = AB + BC + CA = $= \sqrt{2hr} + 2\sqrt{2hr-h^2}$

$$= 2h^{1/2}\left(\sqrt{2r}+\sqrt{2r-h}\right)$$

$$\therefore \lim_{h\to 0}\frac{\Delta}{P^3} = \lim_{h\to 0}\frac{h^{3/2}\sqrt{2r-h}}{8h^{3/2}(\sqrt{2r}+\sqrt{2r-h})^3} = \frac{\sqrt{2}r}{8\left(2\sqrt{2r}\right)^3} = \frac{1}{128\,r}$$

38. Ans: A)

$$\lim_{x\to\frac{\pi}{4}}\frac{2\sqrt{2}\left[1-\frac{1}{2\sqrt{2}}(\cos x+\sin x)^3\right]}{1-\sin 2x}$$

$$= \lim_{x\to\frac{\pi}{4}}\frac{2\sqrt{2}\left[1-\left(\frac{1}{\sqrt{2}}\cos x+\frac{1}{\sqrt{2}}\sin x\right)^3\right]}{1-\sin 2x}$$

$$= \lim_{x\to\frac{\pi}{4}}\frac{2\sqrt{2}\left[1-\cos^3\left(\frac{\pi}{4}-x\right)\right]}{1-\sin 2x}$$

Put $x = \frac{\pi}{4}+h$ then

$$= \lim_{h\to o}\frac{2\sqrt{2}\,[1-\cos^3 h]}{1-\cos 2h} = \lim_{h\to o}\frac{2\sqrt{2}[1-\cos^3 h]}{2\sin^2 h}$$

$$= \lim_{h\to o}\frac{2\sqrt{2}\,[1-\cos^3 h][1+\cos h+\cos^2 h]}{2(1-\cos h)(1+\cos h)}$$

$$= \lim_{h\to o}\frac{\sqrt{2}(1+\cos h+\cos^2 h)}{1+\cos h} = \frac{3\sqrt{2}}{2}$$

39. Ans: B)

Since f is continuity at $x = 0$

$$\lim_{x\to o} f(x) = f(o) = C$$

$$C = \lim_{x\to o}\left(\frac{1+a\cos 3x+b\cos 4x}{x^2\sin^2 x}\right)$$

since it has a finite limit, so a + b + 1 = 0 $\rightarrow$ (1)

$$\therefore C = \lim_{x \to o}\left(\frac{-a-b+a\cos 2x+b\cos 4x}{x^4}\right)$$

$$= \lim_{x \to o}\left[\frac{-a(1-\cos 2x)-b(1-\cos 4x)}{x^4}\right]$$

$$= \lim_{x \to o}\left[\frac{-a\left(\frac{2\sin^2 x}{x^2}\right)-b\left(\frac{2\sin^2 2x}{x^2}\right)}{x^2}\right]$$

Since it has a finite limit

$$2a + 8b = 0 \qquad \rightarrow (2)$$

Solving (1) , (2) $a = \frac{-4}{3}, \quad b = \frac{1}{3}$

$$C = \lim_{x \to o}\left[\frac{4(1-\cos 2x)-(1-\cos 4x)}{3x^4}\right]$$

$$= \lim_{x \to o}\left[\frac{8\sin^2 x - 8\sin^2 x\cos^2 x}{3x^4}\right]$$

$$= \lim_{x \to o}\left[\frac{8\sin^2 x \times \sin^2 x}{(3)x^2 \times x^2}\right]$$

$$C = \frac{8}{3}$$

$$\therefore a+b+c+\frac{1}{3} = \frac{4}{3}+\frac{1}{3}+\frac{8}{3}+\frac{1}{3} = 2$$

40. Ans: D)

Since f is continuous at $x = 0$

$$f(o) = \lim_{x \to o} f(x), \quad \lim_{x \to 4} f(x) = f(4)$$

$$\text{f(o)} = \frac{\left(\frac{4^x-1}{x}\right)^3}{\frac{\sin\left(\frac{x}{p}\right)\log\left[1+\left(\frac{x^2}{3}\right)\right]}{\left(\frac{x}{p}\times p\right)\left(\frac{x^2}{3}\times 3\right)}}$$

$$= 3p(\log 4)^3$$

$$= 3p(\log 4)^3 = 12(\log 4)^3$$

p = 4

41. Ans: C)

f is continuous at $x = 0$

$$\lim_{x \to o} f(x) = f(o)$$

$$\lim_{x \to o}\left[\frac{36^x - 9^x - 4^x + 1}{\sqrt{2} - \sqrt{1+\cos x}}\right] = \lim_{x \to o}\frac{(9^x - 1)(4^x - 1)(\sqrt{2} + \sqrt{1+\cos x})}{1 - \cos x}$$

$$\lim_{x \to o}\frac{\left(\frac{9^x - 1}{x}\right)\left(\frac{4^x - 1}{x}\right)(\sqrt{2} + \sqrt{1+\cos x})}{\frac{2\sin^2\left(\frac{x}{2}\right)}{\frac{x^2}{4}\times 4}}$$

$$= \log 9 . \log 4 \ \ 4\sqrt{2}$$

$$\therefore \log 9 \quad \log 4 \ \ 4\sqrt{2} = K$$

$$16\sqrt{2}\log 3 \quad \log 2 \ = K$$

42. Ans: D)

$$f(x) = [x \sin \pi x]$$

$$0 < x \sin \pi x \le 1$$

$$f(x) = [x \sin \pi x] = 0$$

$\therefore f(x)$ is continuous and differentiable in (-1,1)

43. Ans: C)

$$f(o) = f(o^+) = \lim_{h \to 0} f(o+h)$$

$$= \lim_{h \to 0}\frac{\sqrt{a^2 - ah + h^2} - \sqrt{a^2 + ah + h^2}}{\sqrt{a+h} - \sqrt{a-h}}$$

$$= \lim_{h \to 0}\frac{(a^2 - ah + h^2)^{\frac{1}{2}} - (a^2 + ah + h^2)^{\frac{1}{2}}}{(a^2 - ah + h^2) - (a^2 + ah + h^2)} \times (-2ah) \Bigg/ \frac{(a+h)^{3/2} - (a-h)^{1/2}}{(a+h) - (a-h)} \times 2h$$

$$= -a \lim_{h \to 0}\frac{\frac{1}{2}(a^2 + ah + h^2)^{\frac{-1}{2}}}{\frac{1}{2}(a+h)^{\frac{-1}{2}}}$$

$$= -a\frac{(a^2)^{\frac{-1}{2}}}{(a)^{\frac{-1}{2}}} = -\sqrt{a}$$

44. Ans: D)

$$f(o) = RHL \;\; of \;\; f(x) \; at \, o$$

$$= \lim_{x \to o+} f(x)$$

$$= \lim_{h \to o+} f(o+h)$$

$$= \lim_{h \to o} \frac{2-(256-7h)^{\frac{1}{8}}}{(5h+32)^{3/5}-2}$$

$$\lim_{h \to o} \frac{\frac{(256)^{\frac{1}{8}}-(256-7h)^{\frac{1}{8}}}{256-(256-7h)} \times 7h}{\frac{(5h+32)^{3/5}-(32)^{3/5}}{(5h+32)-32} \times 5h}$$

$$= \frac{\frac{7}{5}\left(\frac{1}{8}\right)(256)^{\frac{-1}{8}}}{\frac{1}{5}(32)\frac{-4}{5}} = \frac{7}{8}(2)^{-3} = \frac{7}{64}$$

45. Ans: C)

$$\lim_{x \to \frac{\pi}{2}-} f(x) = f\left(\frac{\pi}{2}\right) = \lim_{x \to \frac{\pi}{2}} f(x)$$

$$\lim_{h \to 0} f\left(\frac{\pi}{2}-h\right) = a = \lim_{h \to 0} f\left(\frac{\pi}{2}+h\right)$$

$$\lim_{h \to 0} \frac{1-\cos^3 h}{3\sin^2 h} = a = \lim_{h \to 0} \frac{b(1-\cosh)}{4h^2}$$

$$\lim_{h \to 0} \frac{(1-\cos h)(1+\cosh+\cos^2 h)}{3(1-\cos h)((1+\cosh)} = a = \lim_{h \to 0} \frac{b(1-\cosh)}{4h^2}$$

$$\frac{3}{3(2)} = a = \frac{b}{8}$$

$$\frac{b}{a} = 8 \;\; \Rightarrow \;\; \left(\frac{b}{a}\right)^{5/3} \; = \; (8)^{5/3} = 32$$