VERY IMPORTANT QUESTIONS

MATH IB

VSAQs

CH-3 The Straight line

1) Find the equation of the straight line passing through (1,3) and (i) parallel to (ii) perpendicular to the line passing through the points (3,5) and (-6,1)

2) Write the equation of the straight line passin $x=1$ in the Y-axis.

3) Transform the equation $3x+4y-2=5$ into
(i) Slope-intercept
(ii) Intercept form

4) Find the distance between the following parallel lines $5x-3y-4=0$, $10x-6y-9=0$.

5) Find the perpendicular distance from the point (-3,4) to the straight line $5x-12y=2$.

6) Find the equations of the straight line which make an angle 60° with the positive x-axis measured counter-clockwise and passing through the point $\frac{\pi}{3}$ and (1,2)

7) Find the distance between the parallel straight lines $3x-4y=12$, $3x-4y=7$

8) Find the ratio in which the x-axis divide the line segment $\overline{AB}$ joining A(2,-3) and B(-3,6)

9) Find the slopes of the straight lines passing through the following pairs of points (-3,8) (10,5).

10) Transform the following equation into norm form $3x+4y=5$.

11) Find the equation of the line containing the points (2,-3) and (0,-3)

12) Find the slopes of the straight line passing through the following pair of points (3,4), (7,-6).

13) Show that the points $(-5,1)$, $(5,5)$, $(10,7)$ are collinear.

14) Transform the equation $4x-3y+12=0$ into normal form.

15) Find the slope of the line $x+y=0$.

16) Find the length of the perpendicular from $(-2,-3)$ to the Straight line. $5x-2y+4=0$.

17) Find the value of p, if the Straight lines $3x+7y-1=0$ and $7x-py+3=0$ are mutually perpendicular.

18) Find the equation of the straight line passing through $(-2,4)$ and making non-zero intercepts on the coordinate axes

19) Find the value of y, if the line joining the points $(3,y)$ and $(2,7)$ is parallel to the line joining the points $(-1,4)$ and $(0,6)$

CHAPTER-5: Three Dimensional Coordinates

20) Find the ratio in which the xz - plane divides the line joining $A(-2,3,4)$ and $B(1,2,3)$.

21) Find the distance of $P(3,-2,4)$ from the origin.

22) Find the distance between the midpoint of the line segment $\overline{AB}$ and the point $(3,-1,2)$ where $A=(6,3,-4)$ and $B=(-2,-1,2)$

23) If $(3,2,-1)$, $(4,1,1)$ and $(6,2,5)$ are three vertices and $(4,2,2)$ is the centroid of a tetrahedron, find the fourth vertex.

24) Show that the points $(5,4,2)$ $(6,2,-1)$ and $(8,-2,-7)$ are Collinear.

25) Find 'x' if the distance between $(5,-1,7)$ and $(x,5,1)$ is 9 units.

26) Find the fourth vertex of the parallelogram whose Consecutive vertices are $(2,4,-1)$ $(3,6,-1)$ and $(4,5,1)$

27) Find the Coordinates of the vertex 'C' of ΔABC if its Centroid is the origin and the vertices A, B are $(1,1,1)$ and $(-2,4,1)$ respectively.

28) Find the Centroid of the tetrahedron whose vertices are $(2,3,-4)$, $(-3,3,-2)$, $(-1,4,2)$, $(3,5,1)$

29) Find the distance between the points $(3,4,-2)$ and $(1,0,7)$.

CHAPTER- 7: The Plane.

30) Find the angle between the planes $x+2y+2z-5=0$ and $3x+3y+2z-8=0$.

31) Write the equation of the plane $4x-4y+2z+5=0$ in the intercept form.

32) Find the equation of the plane whose intercepts on X, Y, Z - axes are 1, 2, 4 respectively.

33) Reduce the equation $x+2y-3z-6=0$ of the plane to the Normal form.

CHAPTER - 8: Limits and Continuity.

34) Show that $\lim_{x\to 2} \frac{|x-2|}{x-2} = -1$

35) Compute $\lim_{x\to 0} \frac{e^x - \sin x - 1}{x}$.

36) Compute $\lim_{x\to \infty} \frac{8|x|+3x}{3|x|-2x}$.

37) Compute $\lim_{x\to 0} \left[\frac{e^x-1}{\sqrt{1+x}-1}\right]$.

38) $\lim_{x\to 2} \left(\frac{1}{x-2} - \frac{4}{x^2-4}\right)$

39) $\lim_{x\to 0} \left[\frac{e^{7x}-1}{x}\right]$

40) $\lim_{x\to a} \frac{x^2-a^2}{x-a}$.

41) Compute $\lim_{x\to 1} (x^2+2x+3)$

42) Compute $\lim_{x\to 1} \frac{\sin(x-1)}{(x^2-1)}$

43) Find $\lim_{x\to 0} \left[\frac{\sqrt{1+x}-1}{x}\right]$

44) Compute $\lim_{x \to 0} \frac{e^{\sin x} - 1}{x}$

45) Show that $\lim_{x \to 0^+} \left[\frac{2|x|}{x} + x + 1\right] = 3$

46) Evaluate $\lim_{x \to 0} \frac{\log_e(1+5x)}{x}$

47) Compute $\lim_{x \to \pi/2} \left(\frac{\cos x}{x - \frac{\pi}{2}}\right)$

48) Find $\lim_{x \to 0} \frac{e^{3+x} - e^3}{x}$

49) Compute $\lim_{x \to 0} \frac{a^x - 1}{b^x - 1}$

50) Compute $\lim_{x \to 2} \left[\frac{2}{x+1} - \frac{3}{x}\right]$

51) Compute $\lim_{x \to \infty} \frac{x^2+5x+2}{2x^2-5x+1}$

CHAPTER-9: Differentiation.

52) Find the derivatives of the functions i) $\sin^{-1}(3x-4x^3)$
(ii) $\sin^{-1}\left(\frac{2x}{1+x^2}\right)$

53) Find the derivative of $f(x) = e^x(x^2+1)$

54) If $f(x) = x\tan^{-1}x$ then find $f'(x)$.

55) If $y = \sec\sqrt{\tan x}$, find $\frac{dy}{dx}$

56) If $f(x) = 1+x+x^2+\cdots+x^{100}$ then find $f'(1)$.

57) If $f(x) = 2x^2+3x-5$ then prove that $f'(0)+3f'(1)=0$

58) Find the derivatives of the following functions
$\tan^{-1}\left[\frac{a-x}{1+ax}\right]$

59) Find the derivative of the function $e^x + \sin x\cos x$

60) If $y = ae^{nx} + be^{-nx}$ then prove that $y'' = n^2y$.

61) If $f(x) = \log(\sec x + \tan x)$, find $f'(x)$.

62) Find the derivatives of $(4+x^2)e^{2x}$

63) If $f(x) = \log(\tan e^x)$, then find $f'(x)$.

CH- 9

64) If $y = \log(\sin(\log x))$, find $\frac{dy}{dx}$

65) Find the derivatives of the functions $f(x) = 5\sin x + e^x \log x$.

CHAPTER - 10. Applications of Derivatives.

66) Find Δy and dy for the following functions for the values of x and Δx which are shown against of the function. $y = 5x^2 + 6x + 6$, $x = 2$, and $\Delta x = 0.001$

67) Find the slope of the tangent to the curve $y = x^3 - x - 1$ at the point whose x- coordinate is 2.

68) Define strictly increasing function and strictly decreasing functions on an interval point.

69) Find the slope of the tangent to the curve $y = 3x^4 - 4x$ at 4.

70) Verify Rolle's theorem for the function $x^2 - 1$ on $[-1, 1]$.

71) If the increase in the side of a square is 2%. then find the approximate percentage of increase its area.

72) Verify Rolle's theorem for the function $y = f(x) = x^2 + 4$ in $[-3, 3]$.

73) Find Δy and dy for the function $y = x^2 + 3x + 6$ at $x = 10$ and $\Delta x = 0.01$.

74) Find the lengths of Subtangent and sub-normal at a point on the curve $y = b\sin\left[\frac{x}{a}\right]$.

75) If the increase in the side of a Square is 4%. then find the approximate percentage of increase in the area of the square.

76) Find dy and Δy of $y = f(x) = x^2 + x$ at $x = 10$, when $\Delta x = 0.1$.

77) Find the slope of the tangent to the following curve $y = 5x^2$ at $(-1, 5)$

78) Find the approximate value of $\sqrt{82}$.

79) Find the approximations of $\sqrt[3]{65}$.

80) Write the statement of Rolle's theorem.

M-IB $\boxed{\text{SAQS}}$

Ch:01: LOCUS

1) Find the equation of locus of a point 'p' such that $PA^2+PB^2=2C^2$, where $A=(a,0)$ $B=(-a,0)$ & $0<|a|<|c|$

2) If the distance from p to pts $(2,3)$ and $(2,-3)$ are in the ratio $2:3$, then find the equation of the locus of 'p'

3) Find the locus of the third vertex of a right angled triangle, the ends of whose hypotenuse are $(4,0)$ and $(0,4)$

4) Find the locus of third vertex if $(0,6)$ & $(6,0)$ are ends of hypotenuse.

5) $A(2,3)$ and $B(-3,4)$ are two given pts. Find the eqn. of locus of P so that the area of triangle PAB is 8.5.

6) $A(5,3)$ and $B(3,-2)$ are two fixed points. Find the eqn of locus of P, so that area of triangle PAB is 9

7) Find the equation of the locus of a point, the difference of whose distances from $(-5,0)$ & $(5,0)$ is

8) Find the equation of locus of a point which is equidistant from the pts $A(-3,2)$ and $B(0,4)$.

9) If the distance from p to the points $(2,3)$ & $(2,-3)$ are in the ratio $2:3$, then find the eqn of the locus of P.

Ch: 02 : TRANSFORMATION OF AXES

1) When the origin is shifted to the point $(2,3)$ the transformed eqn of curve is $x^2+3xy-2y^2+17x-7y-11=0$.

2) When the origin is shifted to $(-1,2)$ by the translation of axes, find the transformed equation of $x^2+y^2+2x-4y+1=0$.

3) When the axes are rotated through an angle α, find the transformed equation of $x\cos\alpha+y\sin\alpha=p$

4) When the axes are rotated through an angle 45° the T.E of a curve is $17x^2-16xy+17y^2=225$ find original equation of the curve.

5) When the axes are rotated through an angle $\frac{\pi}{6}$ find the transformed eqn of $x^2+2\sqrt{3}xy-y^2=2a^2$

6) When the axes are rotated through an angle $\frac{\pi}{4}$, find T.E of $3x^2+10xy+3y^2=9$

Ch: 03: THE STRAIGHT LINE

7) A straight line through $Q(\sqrt{3},2)$ makes angle $\frac{\pi}{6}$ with the positive direction of the x-axis, if the straight line $\sqrt{3}x-4y+8=0$ at P, find the distance PQ.

8) If $Q(h,k)$ is the foot of the perpendicular from $P(x_1,y_1)$ on the st-line $ax+by+c=0$ then P.T

$$\frac{h-x_1}{a}=\frac{k-y_1}{b}=-\frac{(ax_1+by_1+c)}{a^2+b^2}.$$

9) Find the value of P, if the straight $x+p=0$, $y+2=0$ and $3x+2y+5=0$ are concurrent.

10) Find the value of K, if the angle between the straight lines $4x-y+7=0$ and $kx-5y-9=0$ is 45°.

11) Transform the equation $\frac{x}{a}+\frac{y}{b}=1$ into the normal form when $a>0$ & $b>0$. If the perpendicular distance of the straight line from the origin is p. deduce that $\frac{1}{p^2}=\frac{1}{a^2}+\frac{1}{b^2}$

12) Find the foot of the perpendicular drawn (4,1) upon straight line $3x-4y+12=0$.

13) Find the image of the point (1,2) in the straight line $3x+4y-1=0$

Ch:08: LIMITS AND CONTINUITY

14) Compute $\lim_{x\to\infty} \frac{11x^3-3x+4}{13x^3-5x^2-7}$

15) $\lim_{x\to 3} \frac{x^2-8x+15}{x^2-9}$

16) Check the continuity of the fn of 'f' given below at 1 and 2.

$$f(x)=\begin{cases} x+1 & \text{if } x\le 1 \\ 2x & \text{if } 1<x<2 \\ 1+x^2 & \text{if } x\ge 2 \end{cases}$$

17) Check the continuity of 'f' given by

$$f(x)=\begin{cases}\dfrac{x^2-9}{x^2-2x-3} & \text{if } 0<x<5 \text{ \& } x\neq 3 \text{ at pt. } 3\\ 1.5 & \text{if } x=3\end{cases}$$

18) Show that $f(x)=\begin{cases}\dfrac{\cos ax-\cos bx}{x^2} & \text{if } x\neq 0\\ \frac{1}{2}(b^2-a^2) & \end{cases}$ where 'a' & 'b' are real constant is Continuous at '0'.

19) Check the continuity of the following function at '2'

$$f(x)=\begin{cases}\frac{1}{2}(x^2-4) & \text{if } 0<x<2\\ 0 & \text{if } x=2\\ 2-8x^{-3} & \text{if } x>2\end{cases}$$

20) Check for $f(x)=\begin{cases}\dfrac{\sin 2x}{x}, & \text{if } x\neq 0\\ 1 & \text{if } x=0\end{cases}$ at the pt '0'?

21) Compute $\lim_{x\to 0}\left(\dfrac{\cos ax-\cos bx}{x^2}\right)$

22) $\lim_{x\to 0}\dfrac{1-\cos 2mx}{\sin^2 nx}$ $(m,n\in\mathbb{Z})$

23) $\lim_{x\to a}\left(\dfrac{x\sin a-a\sin x}{x-a}\right)$.

Ch:09: DIFFERENTIATION

24) Find the derivative of $f(x) = \frac{x\cos x}{\sqrt{1+x^2}}$

25) If $y = \frac{\sin(x+a)}{\cos x}$, S.T $\frac{dy}{dx} = \frac{\cos a}{\cos^2 x}$.

26) Find $\frac{dy}{dx}$ for function $x = a(\cos t + t\sin t)$, $y = a(\sin t - t\cos t)$

27) If $x^{2/3} + y^{2/3} = a^{2/3}$ then $\frac{dy}{dx} = -\sqrt[3]{\frac{y}{x}}$

28) Find the derivative of the function "$\cot x$" from the first principle.

29) $\sin 2x$ from first principle

30) $\cos ax$ " " "

31) $\tan 2x$ " " "

32) $\cos^2 x$ " " "

33) Find the derivative of $f(x) = \frac{1-\cos 2x}{1+\cos 2x}$.

Ch:10: Application of Derivatives

34) The displacement 'S' of a particle travelling in a straight line in 't' seconds is given by $S = 45t + 11t^2 - t^3$. Find the time when particle comes to rest.

35) Find the eqns of tangents and normal to the curve $x = \cos t$, $y = \sin t$ at $t = \frac{\pi}{4}$

36) $y = x^3 + 4x^2$ at $(-1, 3)$

37) Find the lengths of sub-tangent, subnormal at a point 't' on the curve $x = a(\cos t + t\sin t)$, $y = a(\sin t - t\cos t)$

38) Find two positive integers whose sum is 16 and sum whose squares is minimum.

39) Find the point at which the tangent to the curve $y = x^3 - 3x^2 - 9x$ is parallel to the x-axis.

40) S.T the curves $6x^2 - 5x + 2y = 0$ & $4x^2 + 8y^2 = 3$ touch each other at $(\frac{1}{2}, \frac{1}{2})$

41) S.T the tangent at any point "θ" on the curve $x = c\sec\theta$, $y = c\tan\theta$ is $y\sin\theta = x - c\cos\theta$.

42) The volume of a cube is increasing at the rate of $8cm^3/sec$. How fast is the surface area increasing when the length of an edge is 12cm?

43) Same as above at the rate of $9cm^3/sec$ when the length of an edge is 10cm?

44) A point 'p' is moving on the curve $y = 2x^2$. The x' co-ord. of 'p' is increasing at the rate of 4units/sec. Find the rate at which the y-co-ordinate is increasing when pt is at $(2, 8)$.

LAQ's

CHAPTER-3: The Straight line

1) Find the angles of the triangle whose sides are $x+y-4=0$, $2x+y-6=0$ and $5x+3y-15=0$.

2) If P and q are the lengths of the perpendiculars from the origin to the straight lines $x\sec\alpha+y\operatorname{cosec}\alpha=a$ and $x\cos\alpha-y\sin\alpha=\cos2\alpha$. Prove that $4p^2+q^2=a^2$.

3) Find the equations of the straight line passing through the point $(-3,2)$ and making an angle of 45° with the straight line $3x-y+4=0$.

4) Find the orthocentre of the triangle with following vertices $(5,-2)$, $(-1,2)$ and $(1,4)$.

5) Find the orthocentre of the triangle with following vertices $(-2,-1)$, $(6,-1)$ and $(2,5)$

6) Find the circumcentre of the triangle whose vertices are $(1,3)$, $(-3,5)$ and $(5,-1)$.

7) Find the circumcentre of the triangle whose vertices are $(-2,3)$, $(2,-1)$ and $(4,0)$.

8) Find the equation of the straight line parallel to the line $3x+4y=7$ and passing through the point of intersection of the lines $x-2y-3=0$ and $x+3y-6=0$

CHAPTER-4: Pair of Straight lines.

9) Show that the lines joining the origin to the points of intersection of the curve $x^2-xy+y^2+3x+3y-2=0$ and straight line $x-y-\sqrt{2}=0$ are mutually perpendicular.

10) Show that the product of the perpendicular distances from the origin to the pair of straight lines represented by $ax^2+2hxy+by^2+2gx+2fy+c=0$ is

$$\frac{|c|}{\sqrt{(a-b)^2+4h^2}}.$$

11) Show that the lines represented by $(lx+my)^2-3(mx-ly)^2=0$ and $lx+my+n=0$ form an equilateral triangle with area $\frac{n^2}{\sqrt{3}(l^2+m^2)}$.

12) Show that the product of the perpendicular distance from a point (α,β) to the pair of straight lines $ax^2+2hxy+by^2=0$ is $\frac{|a\alpha^2+2h\alpha\beta+b\beta^2|}{\sqrt{(a-b)^2+4h^2}}$

13) Find the angle between the lines joining the origin to the points of intersection of the curve $x^2+2xy+y^2+2x+2y-5=0$ and the line $3x-y+1=0$.

14) Show that the area of the triangle formed by the lines $ax^2+2hxy+by^2=0$ and $lx+my+n=0$ is $\left|\frac{n^2\sqrt{h^2-ab}}{am^2-2hlm-bl^2}\right|$.

15) Find the condition for the chord $lx+my=1$ of the circle $x^2+y^2=a^2$ to subtend a right angle at the origin.

16) Find the condition for the lines joining the origin to the points of intersection of the circle $x^2+y^2=a^2$ and the line $lx+my=1$ to coincide.

CH-4 : Pair of Straight Lines

17) If the equation $ax^2+2hxy+by^2=0$ represents a pair of straight lines, then show that the angle θ between the lines is given by $\cos\theta = \frac{|a+b|}{\sqrt{(a-b)^2+4h^2}}$

18) If the equation $S \equiv ax^2+2hxy+by^2+2gx+2fy+c=0$ represents a pair of parallel lines then

(i) $h^2=ab$ (ii) $af^2=bg^2$ (iii) parallel lines $= 2\sqrt{\frac{g^2-ac}{a(a+b)}} = 2\sqrt{\frac{f^2-bc}{b(a+b)}}$.

CHAPTER : 6 Direction Cosines and Direction Ratios

19) Find the angle between the lines whose direction Cosines are given by the equations $3l+m+5n=0$ and $6mn-2nl+5lm=0$.

20) Find the angle between the lines whose direction Cosines satisfy the equations $l+m+n=0$, $l^2+m^2-n^2=0$.

21) Show that the lines whose d.c's are given by $l+m+n=0$, $2mn+3nl-5lm=0$ are perpendicular to each other.

22) Find the angle between two diagonals of Cube.

23) Find the direction cosines of two lines which are Connected by the relations $l-5m+3n=0$ and $7l^2+5m^2-3n^2=0$.

CHAPTER - 9 : Differentiation

24) If $y = x\sqrt{a^2+x^2}+a^2\log(x+\sqrt{a^2+x^2})$ then prove that $\frac{dy}{dx} = 2\sqrt{a^2+x^2}$.

25) Find the derivatives of the function $\log(\tan 5x)$

26) Establish if $x^{\log y} = \log x$ then $\frac{dy}{dx} = \frac{y}{x}\left[\frac{1-\log x \log y}{\log^2 x}\right]$

27) Establish the following if

$y = \tan^{-1}\left(\frac{2x}{1-x^2}\right) + \tan^{-1}\left(\frac{3x-x^3}{1-3x^2}\right) - \tan^{-1}\left(\frac{4x-4x^3}{1-6x^2+x^4}\right)$ then

$\frac{dy}{dx} = \frac{1}{1+x^2}$

28) Find the derivatives of the function

(i) $\frac{1-\cos 2x}{1+\cos 2x}$ (ii) $\cot^n x$.

29) Establish if $\sqrt{1-x^2} + \sqrt{1-y^2} = a(x-y)$ then $\frac{dy}{dx} = \sqrt{\frac{1-y^2}{1-x^2}}$

30) If $x^y = y^x$ then show that $\frac{dy}{dx} = \frac{y(x\log y - y)}{x(y\log x - x)}$

CHAPTER- 10 Applications of Derivatives

31) Find the angle between the curves $y^2 = 8x$; $4x^2+y^2 = 32$.

32) Find two positive numbers whose sum is 15 so that the sum of their squares is minimum.

33) Find the angle between the curves $y^2 = 4x$; $x^2+y^2 = 5$.

34) If $ax^2+by^2 = 1$, $a_1x^2+b_1y^2 = 1$ then show that the condition for orthogonality of above curves is $\frac{1}{a} - \frac{1}{b} = \frac{1}{a_1} - \frac{1}{b_1}$

35) If the tangent at any point on the curve $x^{2/3}+y^{2/3}=a^{2/3}$ intersects the coordinates axes in A and B, then show that the length AB is a constant.

36) At any point 't' on the curve $x=a(t-\sin t)$, $y=a(1-\cos t)$, find the lengths of tangent, normal, subtangent and subnormal.

37) Find the maximum area of the rectangle that can be formed with fixed perimeter 20.