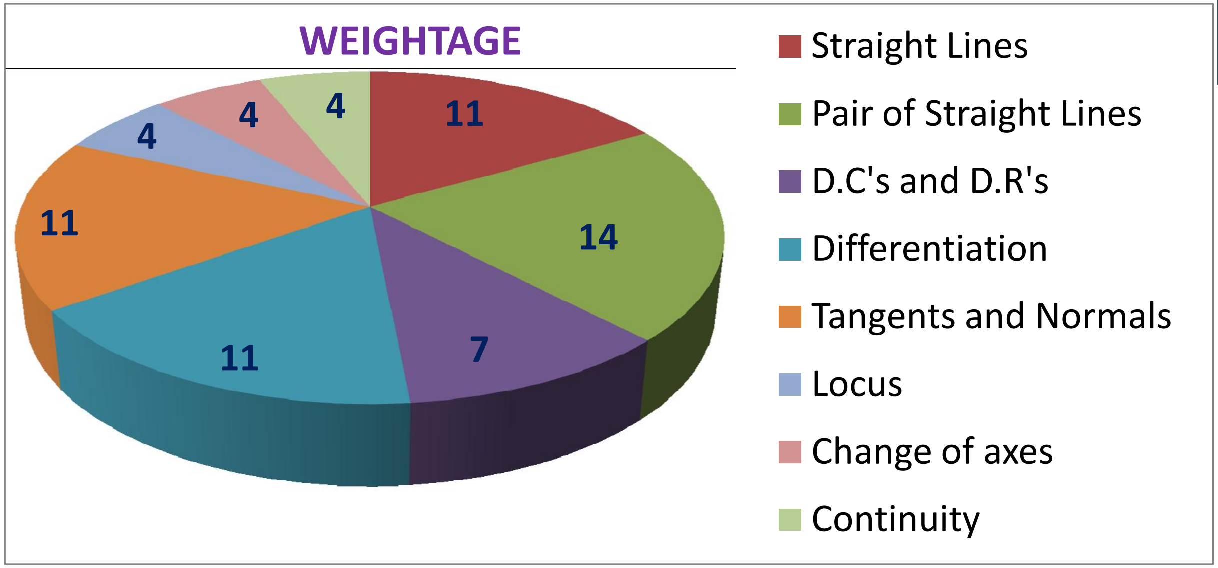
MATHS - 1B TOPIC WISE WEIGHTAGE

How to Score Minimum 45-65 Marks For Slow Learners

S.NO	CHAPTER NAME	EASY / MODERATE	NO OF QUESTIONS		WEIGHTAGE
			LAQ's	SAQ's	
1	Straight Lines	Easy	14	8	**11**
2	Pair of Straight Lines	Moderate	17	-	**14**
3	D.C's and D.R's	Easy	7	-	**7**
4	Differentiation	Difficult	10	8	**11**
5	Tangents and Normals	Difficult	8	6	**11**
6	Locus	Easy	-	12	**4**
7	Change of axes	Easy	-	5	**4**
8	Continuity	Moderate	-	5	**4**
	TOTAL		56	44	**66**



VSAQ's

Chapter Name	No of Questions	Minimum No of Marks
Straigt Lines	18	4
3D-Geometry	11	2
Planes	9	2
Mean value Theorem	8	2
Total	**46**	**10**

Number of Questions Covered In these Topics

	Minimum		Maximum	
	Question	Marks	Question	Marks
LAQ's	4	28	5	35
SAQ's	3	12	5	20
VSAQ's	4	5	5	10
Total	**11**	**45**	**15**	**65**

MATHS-1B

LAQ's (7 Marks Questions)

STRAIGHT LINE

1. 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 $x\cos\alpha - y\sin\alpha = a\cos 2\alpha$, prove that $4p^2 + q^2 = a^2$.

2. If Q(h,k) is the image of the point P (x_1, y_1) w.r.t the straight line ax + by + c = 0. Then $\frac{h-x_1}{a} = \frac{k-y_1}{b} = \frac{-2(ax_1+by_1+c)}{a^2+b^2}$ and find the image of (1, -2) w.r.t. The straight line 2x-3y+5= 0.

3. If Q(h,k) is the foot of the perpendicular from P (x_1, y_1) on the line ax + by + c= 0, then prove that $\frac{h-x_1}{a} = \frac{k-y_1}{b} = \frac{-(ax_1+by_1+c)}{a^2+b^2}$. Also find the foot of the perpendicular from (-1,3) on the line $5x - y - 18 = 0$.

4. Find the equations of the straight lines passing through the point of intersection of the lines 3x + 2y +4= 0, 2x + 5y =1 and whose distance from (2, -1) is 2.

5. Find the circumcentre of the triangle with the vertices (-2,3),(2,-1) and (4,0)

6. Find the circumcentre of the triangle formed by the points (1,3), (0,–2), (–3, 1)

7. Find the circum center of the triangle whose vertices are (1,3), (-3, 5) and (5, -1).

8. Find the circumcentre of the triangle whose sides are 3x-y-5=0, x +2y -4= 0 and 5x +3y +1= 0.

9. Find the circum centre of the triangle with vertices (-2,3) (2,-1) (4,0)

10. If the equations of the sides of a triangle are 7x +y -10 =0, x-2y+5= 0 and x + y +2=0. Find the orthocentre of the triangle.

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

12. Find the orthocentre of the triangle with the vertices (–5, –7), (13,2) & (–5, 6)

13. The base of an equilateral Δ^{le} is x+y-2=0 and opposite vertex is (2,-1). Find the equation of the remaining sides?

14. Find the equations of the straight lines passing through the point (1,2) and making an angle of 60^0 with the line $\sqrt{3}x + y + 2 = 0$ s

PAIR OF STRAIGHT LINES

15. Let the equation $ax^2 + 2hxy + by^2 = 0$ repsresents a pair of straight lines. Then the angle θ between the lines is given by $\cos\theta = \frac{a+b}{\sqrt{(a-b)^2+4h^2}}$ hence deduce tance.

16. Show that the product of the perpendicular distances from a point (α, β) to the pair of straight lines

$ax^2 + 2hxy + by^2 = 0$ is $\dfrac{|a\alpha^2 + 2h\alpha\beta + b\beta^2|}{\sqrt{(a-b)^2 + 4h^2}}$.

17. Show that the area of the triangle formed by the lines $ax^2 + 2hxy + by^2 = 0$ and $lx + my + n = 0$ is $\dfrac{n^2\sqrt{h^2 - ab}}{|am^2 - 2hlm + bl^2|}$ sq. units

18. If the equation $ax^2 + 2hxy + by^2 = 0$ represents a pair of distinct (i.e., intersecting) lines, then the combined equation of the pair of bisectors of the angles between these lines is $h(x^2 - y^2) = (a-b)xy$.

19. If the equation $S = ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represents a pair of parallel straight lines, then show that (i) $h^2 = ab$ (ii) $af^2 = bg^2$ and (iii) the distance between the parallel lines is $2\sqrt{\dfrac{g^2 - ac}{a(a+b)}} = 2\sqrt{\dfrac{f^2 - bc}{b(a+b)}}$.

20. If the second degree equation $S = ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ in two variables x and y represents a pair of straight lines, then

(i) $abc + 2fgh - af^2 - bg^2 - ch^2 = 0$ and (ii) $h^2 \geq ab,\ g^2 \geq ac$ and $f^2 \geq bc$

21. Find the values of k, if the lines joining the origin to the points of intersection of the curve $2x^2 - 2xy + 3y^2 + 2x - y - 1 = 0$ and the line $x + 2y = k$ are mutually perpendicular.

22. 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 $3x - y + 1 = 0$.

23. 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 the straight line $x - y - \sqrt{2} = 0$ are mutually perpendicular.

24. 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.

25. 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.

26. Find the equation to the pair of lines joining the origin to the points of intersection of the curve $7x^2 - 4xy + 8y^2 + 2x - 4y - 8 = 0$ with the straight the $3x - y = 2$ and the angle between them.

27. Find the equations of the pair of straight line joining the origin to the point of intersection of the line $6x - y + 8 = 0$ with the pair of straight lines $3x^2 + 4xy - 4y^2 - 11x + 2y + 6 = 0$. Show that the lines so obtained makes equal angles with the coordinate axes.

28. Show that the pair of straight lines i) $6x^2 - 5xy - 6y^2 = 0$ and $6x^2 - 5xy - 6y^2 + x + 5y - 1 = 0$ forms a square.

ii) $3x^2 + 8xy - 3y^2 = 0$ and $3x^2 + 8xy - 3y^2 + 2x - 4y - 1 = 0$ from a square

29. Find the centroid and area of the triangle formed by the lines

i) $12x^2-20xy+7y^2=0, 2x-3y+4=0$ ii) $2y^2-xy-6x^2=0, x+y+4=0$

30. Show the following lines from an equilateral triangle and find the area of the triangle

$(x+2a)^2-3y^2=0, x=a$

31. If the equation λx^2-10xy+12y²+5x-16y-3=0 represents a pair of straight lines then find 'λ'

and also find angle between lines and point of intersetion of the lines for this value of 'λ'

DIRECTION COSINES AND DIRECTION RATIOS

32. i)If a ray makes the angles α, β, γ and δ with four diagonals of a cube then prove that $\cos^2\alpha+\cos^2\beta+\cos^2\gamma+\cos^2\delta$ = 4/3.

ii) Find the angle between two diagonals of a cube

33. Find the angle between two diagonals of a cube.

34. Find the angle between the lines whose direction cosines satisfy the equations

i) $l+m+n=0$, $l^2+m^2-n^2=0$ ii) $3l+m+5n=0$ and $6mn-2nl+5lm=0$.

35. Find the direction cosines of two lines which are connected by the relation

i) $\ell-5m+3n=0$ and $7\ell^2+5m^2-3n^2=0$

ii) $l+m+n=0$ and $mn-2nl-2lm=0$.

36. Show that the lines whose D.C's are given by $\ell+m+n=0$, $2mn+3n\ell-5\ell m=0$ are perpandicular to each other.

37. The vertices of Δ ABC are A (1 , 4, 2), B(-2 , 1, 2) ,C (2, 3, -4) .Find $\angle A, \angle B, \angle C$

38. Show that the four points (5,-1,1),(-1,-3,4)(1,-6,10),(7,-4,7) taken in order form a rhombus

DIFFERENTIATION

39. If $\sqrt{1-x^2}+\sqrt{1-y^2}=a(x-y)$ then show that $\frac{dy}{dx}=\sqrt{\frac{1-y^2}{1-x^2}}$

40. Find $\frac{dy}{dx}$ if i) $y=(\sin x)^x+x^{\sin x}$ ii) $y=x^{\tan x}+(\sin x)^{\cos x}$, iii) $(\sin x)^{\tan x}+x^{\cos x}$

41. If $y=Tan^{-1}\left[\frac{\sqrt{1+x^2}+\sqrt{1-x^2}}{\sqrt{1+x^2}-\sqrt{1-x^2}}\right]$ for $0<|x|<1$ find $\frac{dy}{dx}$.

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

43. If $x^y+y^x=a^b$ then show that $\frac{dy}{dx}=-\left[\frac{yx^{y-1}+y^x\log y}{x^y\log x+xy^{x-1}}\right]$

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

45. If $f(x) = \sin^{-1}\sqrt{\frac{x-\beta}{\alpha-\beta}}$ and $g(x) = Tan^{-1}\sqrt{\frac{x-\beta}{\alpha-x}}$ then show that $f^1(x) = g^1(x)$ $(\beta < x < \alpha)$.

46. 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 show that $\frac{dy}{dx} = \frac{1}{1+x^2}$.

47. Find the derivative $\frac{dy}{dx}$ of the function $y = \frac{(1-2x)^{2/3}(1+3x)^{-3/4}}{(1-6x)^{5/6}(1+7x)^{-6/7}}$

48. Find the derivative of $f(x) = Tan^{-1}\left(\frac{2x}{1-x^2}\right)$ w.r to $g(x) = \sin^{-1}\left(\frac{2x}{1+x^2}\right)$.

TANGENTS AND NORMALS

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

50. If the tangent at any point P on the curve $x^m y^n = a^{m+n}$ $(mn \neq 0)$ meets the coordinate axes in A and B then show that AP : BP is a constant.

51. Show that the equation of tangent to the curve $\sqrt{x} + \sqrt{y} = \sqrt{a}$ at the point (x_1, y_1) is $xx_1^{-\frac{1}{2}} + yy_1^{-\frac{1}{2}} = a^{\frac{1}{2}}$

52. Show that the curves $y^2 = 4(x+1)$ and $y^2 = 36(9-x)$ intersect orthogonally.

53. Show that the curves $6x^2-5x+2y=0$ and $4x^2+8y^2=3$ touch eachother at $\left(\frac{1}{2}, \frac{1}{2}\right)$

54. Show that the condition for the orthogonality of the curves $ax^2 + by^2 = 1$ and $a_1x^2 + b_1y^2 = 1$ is $\frac{1}{a} - \frac{1}{b} = \frac{1}{a_1} - \frac{1}{b_1}$.

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

CONTINUITY

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

57. If f is given by $f(x)=\begin{cases} k^2x-k \text{ if } x\ge 1 \\ 2 \text{ if } x<1 \end{cases}$ is continuous function on IR then find k =?

58. Check the continuity of f given by $f(x)=\begin{cases} \dfrac{x^2-9}{x^2-2x-3} & \text{if} \quad 0<x<5 \text{ and } x\ne 3 \\ 1.5 & \text{if} \quad x=3 \end{cases}$ at the point '3'

59. If 'f' defined by $f(x)=\begin{cases} \dfrac{\sin 2x}{x} & \text{if} \quad x\ne 0 \\ 0 & \text{if} \quad x=0 \end{cases}$ continuous at 0?

60. Check the continuity of the $f(x)$ at '2' $f(x)=\begin{cases} \dfrac{1}{2}(x^2-4) & \text{if} \quad 0<x<2 \\ 0 & \text{if} \quad x=2 \\ 2-8x^{-3} & \text{if} \quad x>2 \end{cases}$

61. Find real constant a,b so that the function f given by $f(x)=\begin{cases} \sin x & \text{if} \quad x\le 0 \\ x^2+a & \text{if} \quad 0<x<1 \\ bx+3 & \text{if} \quad 1\le x\le 3 \\ -3 & \text{if} \quad x>3 \end{cases}$ is continuous on IR

DIFFERENTIATION

62. Find the derivatives of the following functions from the first principle

i) sin2x ii) cosax iii) tan2x iv) sec3x v) $\cos^2 x$

63. If $x^y = e^{x-y}$ then show that $\dfrac{dy}{dx}=\dfrac{\log x}{(1+\log x)^2}$

64. If $y = x^y$ then show that $\dfrac{dy}{dx}=\dfrac{y^2}{x(1-\log y)}=\dfrac{y^2}{x(1-y\log x)}$

65. If $\sin y = x.\sin(a+y)$ then show that $\dfrac{dy}{dx}=\dfrac{\sin^2(a+y)}{\sin a}$

66. Find $\dfrac{dy}{dx}$ for the function $x=a(\cos t+t\sin t), y=a(\sin t-t\cos t)$

STRAIGHT LINES

67. If the straight lines $ax + by + c = 0, bx + cy + a = 0$ and $cx + ay + b = 0$ are concurrent then prove that $a^3 + b^3 + c^3 = 3abc$

68. Find the value of k if the lines $2x - 3y + k = 0, 3x - 4y - 13 = 0$ and $8x - 11y - 33 = 0$ are concurrent

69. Transform the equation $\frac{x}{a} + \frac{y}{b} = 1$ into the normal form. If the $\perp$ distance of straight line from the origin is p then prove that $\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$

70. A straight line through $Q\left(\sqrt{3}, 2\right)$ makes an angle $\frac{\pi}{6}$ with positive direction of the x-axis. If the straight line intersects the line $\sqrt{3}x - 4y + 8 = 0$ at p, find the distance PQ

71. A straight line through $Q(2,3)$ makes an angle $\frac{3\pi}{4}$ with the negative direction of the x-axis. If the straight line intersects the line x+y-7=0 at p. find the distance PQ

72. Find the value of k if the angle between $4x - y + 0 = 0$ and $kx - 5y - 9 = 0$ is 45^0

73. Find the points on the line $4x - 3y - 10 = 0$ which are at a distance of 5 units from (1,-2)

TANGENTS AND NORMALS

74. Find the equations of the tangent and normal to the curve

    i) $y = x^4 - 6x^3 + 13x^2 - 10x + 5$ at (0,5) ii) $y = x^2 - 4x + 2$ at (4,2)

    iii) $y = 5x^4$ at (1,5)

75. Find the equations of the tangent and normal to the curve $xy = 10$ at (2,5)

76. find the lengths of sub tangent, subnormal at a point t on the curve $x = a\left(\cos t + t\sin t\right), y = a\left(\sin t - t\cos t\right)$

77. Find the lengths of normal and subnormal at a point on the curve $y = \frac{a}{2}\left(e^{\frac{x}{a}} + e^{\frac{-x}{a}}\right)$

78. Show that the tangents at any point on the curve $x = c\sec\theta \lim_{\delta x \to 0}, y = c\tan\theta$ is $y\sin\theta = x - c.\cos\theta$

79. i) Show that the length of the subnormal at any point on the curve $y^2 = 4ax$ is a constant

    ii) Show that the length of the sub tangent at any point on the curve $y = a^x$ is a constant

SAQ's (4 Marks Questions)

LOCUS

1. Find the equation of locus of P, if the line segment joining (2,3) and (-1,5) subtends a right angle at P.
2. Find the locus of the third vertex of a right angled triangle, the ends of whose hypotenuse are

   i) (4,0) and (0,4) ii) (6,0) & (0,6).
3. A(2,3) and B(–3, 4) be two given points. Find the equation of locus of P so that area of $\triangle PAB$ is 8.5
4. A (5,3) and B (3, -2) are two fixed points. Find the equation of locus of P, so that the area of triangle PAB is 9 sq. units.
5. i) find the equation of the locus of p if the ratio of the distances from p to A(5,-4) and B97,6) is 2:3

   ii) If the distances from P to the points (2,3) and (2,-3) are in the ratio 2:3 then find the equation of the locus of P
6. A (1,2), B (2, -3) and C (-2, 3) are three points. A point 'P' moves such that $PA^2+PB^2=2PC^2$. Show that the equation to the locus P is 7x-7y+4= 0.
7. Find the equation of locus of a point P such that $PA^2 + PB^2 = 2c^2$, where $A = (a,0)$ and $B = (-a,0)$
8. Find the equation of locus of P, if $A = (4,0), B = (-4,0)$ and $|PA - PB| = 4$
9. Find the equation of the locus of apoint, the difference of whose distances from (-5,0) and (5,0) is 8
10. Find the equation of locus of P, if A = (2,3), B = (2, -3) and PA + PB = 8.
11. Find the equation of the locus of a point, the sum of whose distances from (0,2) and (0,-2) is 6
12. Find the equation of locus of a point 'p' such that the distance of p from the origin is twice the distance of p from A(1,2)

STRAIGHT LINE

13. Transform the equation $\frac{x}{a}+\frac{y}{b}=1$ into the normal form when a > 0 and b >0. If the perpendicular distance of straight line from the origin is p, deduce that $\frac{1}{p^2}=\frac{1}{a^2}+\frac{1}{b^2}$.
14. If the straight lines ax + by +c= 0, bx +cy +a= 0 and cx +ay + b =0 are concurrent, then prove that

    $a^3 + b^3 + c^3 = 3abc$.
15. Find the value of k, if the lines 2x -3y + k =0, 3x -4y -13 = 0 and 8x -11y -33= 0 are concurrent.
16. A straight line through $Q\left(\sqrt{3},2\right)$ makes an angle $\frac{\pi}{6}$ with the positive direction of the X-axis. If the straight line intersects the line $\sqrt{3}x-4y+8=0$ at P, find the distance PQ.
17. A straight line through Q(2,3) makes an angle $\frac{3\pi}{4}$ with the negative direction of the x-axis. If the straight line intersects the line x+y-7=0 at p. find the distance PQ

18. Find the points on the line 4x -3y -10=0 which are at a distance of 5 units from the point (1, -2).

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

20. Transform the equation $\sqrt{3}x + y = 4$ into (a) slope - intercept form (b) intercept form and (c) normalform.

VSAQ's (2 Marks Questions)

3D-GEOMETRY

2 Marks:

1. The centroid of the triangle whose vertices are $(5,4,6),(1,-1,3)$ and $(4,3,2)$

2. 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.

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

4. Find the ratio in which YZ-=plane dives the line joining A(2,4,5) and B(3,5,-4). Also find the point of intersection.

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

6. Find the coordinates of the vertex 'C' of triangle ABC if its centroid is the origin and vertices A,B are (1,1,1) and (-2,4,1) respectively

7. For what value of t, the points (2,-1,3),(3,-5,t) and (-1,11,9) are collinear?

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

9. Find the centroid fo the tetrahedron whose vertices $(2,3,-4)(-3,3,-2)(-1,4,2)(3,5,1)$

10. Show that $A(1,2,3)\ B(7,0,1)C(-2,3,4)$ are collinear

11. Show that the point $(1,2,3),(2,3,1),(3,1,2)$ forms an equilateral triangle

MEAN VALUE THEOREM

12. Verify the Rolle's theorem for the function

    i) $f(x) = x^2 + 4$ in $[-3,3]$ ii) $f(x) = \sin x - \sin 2x$ on $[0,\pi]$

13. It is given that Rolle's theorem holds for the function $f(x) = x^3 + bx^2 + ax$ on $[1,3]$ with $C = 2 + \frac{1}{\sqrt{3}}$, find the values of a and b

14. Find the C so that $f^1(c) = \frac{f(b) - f(a)}{b - a}$ in teh following cases

    i) $f(x) = x^2 - 3x - 1, a = \frac{-11}{7}, b = \frac{13}{7}$ ii) $f(x) = e^x, a = 0, b = 1$

15. Verify the Rolle's theorem for the function $(x^2 - 1)(x - 2)$ on $[-1,2]$ find the point in the interval

where the dervate vanishes

16. Verify the conditions of the lagrange's mean value theorem for the following functions in each case

17. Find the point 'c' in the interval as stated by the theorem

i) x^2 on $[2,3]$ ii) $\sin x - \sin 2x$ on $[0,\pi]$

18. On the curve $y = x^2$ find A point at which the tangent is parallel to the chord joining $(0,0)$ and $(1,1)$

19. Show that there is no real number K, for for which the equation $x^2 - 3x + k = 0$ has two distinct roots in $[0,1]$

20. let $f(x) = (x-1)(x-2)(x-3)$ prove that there is more than one 'c' in $(1,3)$ such that $f^1(c) = 0$