1. If A, B and C are any three non-empty sets, prove that $A-(B\cup C)=(A-B)\cap(A-C)$.
2. Define disjunction of two statements. Prepare a truth table for the compound statement $\sim(p\vee q)$.
3. Write the truth table for $p\wedge q\Rightarrow p\vee q$ hence draw a conclusion from the truth table.
4. Find the distance between the lines $3x-4y+9=0$ and $6x-8y-17=0$.
5. Evaluate: $\lim_{x\to y}\frac{\tan x-\tan y}{x-y}$.
6. Find the limit of $f(x)=\frac{x^2-4}{x-2}$ as $x\to 2$. Is $f(x)$ continuous? If not, find the point of discontinuity.
7. If the equation $x^2+px+q=0$ and $x^2+qx+p=0$ have a common root prove that either $p=q$ or $p+q+1=0$.
8. Let p and q be any two statements, prove that $\sim(p\vee q)\equiv(\sim p\wedge\sim q)$.
9. Find the angle between two straight lines whose equations are $y=m_1x+c_1$ and $y=m_2x+c_2$. Also find the conditions under which the two straight lines will be (i) perpendicular (ii) parallel.
10. Find $A\cup B$, if $A=\{x: x=2n+1, n\le 5, n\in N\}$ and $B=\{x: x=3n-2, n\le 4, n\in N\}$
11. If one root of the equation $x^2-px+q=0$ be twice the other, show that $2p^2=9q$.
12. If one root of the equation $ax^2+bx+c=0$ be the square of the other, prove that $b^3+a^2c+ac^2=3abc$.
13. Evaluate $\lim_{x\to\theta}\frac{x\sin\theta-\theta\sin x}{x-\theta}$.
14. Evaluate $\lim_{x\to\theta}\frac{x\tan\theta-\theta\tan x}{x-\theta}$
15. Find the condition that one of the lines given by $ax^2+2hxy+by^2=0$ may be perpendicular to one of the lines given by $a'x^2+2h'xy+b'y^2=0$.
16. Find the equation of the sides of the right angled isosceles triangle vertex is (-2, -3) and whose base is $x=0$.
17. Evaluate: $\lim_{x\to a}\frac{\sin(x-a)}{x^2-a^2}$.
18. State and prove the De-Morgan's law.
19. Evaluate $\lim_{x\to y}\frac{\sin x-\sin y}{x-y}$.
20. If the equation $ax^2+2hxy+by^2+2gx+2fy+c=0$ represent a pair of parallel lines, prove that i) $\frac{a}{h}=\frac{h}{b}=\frac{g}{f}$ and ii) the distance between them is $2\sqrt{\frac{g^2-ac}{a^2+ab}}$
21. Given $A=\{1,2,3\}$ and $B=\{3,4,5,6\}$, show that $A-(A-B)=A\cap B$.
22. If the equation $(1+m^2)x^2+2mcx+c^2-a^2=0$ has equal roots, show that $c^2=a^2(1+m^2)$.
23. Prove geometrically $\lim_{\theta\to 0}\frac{\sin\theta}{\theta}=1$.
24. If p and p′ be the length of the perpendicular from the origin upon the straight line whose equation are $x\sec\theta+y\,\mathrm{cosec}\,\theta=a$ and $x\cos\theta-y\sin\theta=a\cos 2\theta$. Prove that $4p^2+p'^2=a^2$.
25. For any two real numbers x and y show that $|x+y|\le|x|+|y|$.
26. Solve the inequality $|2x-1|\ge 3$ and draw its graph.
27. Prove that the equation of the straight line passing through the point $(a\cos^3\theta, a\sin^3\theta)$ and is parallel to the straight line $x\,\mathrm{cosec}\,\theta-y\sec\theta=a$ is $x\cos\theta-y\sin\theta=a\cos 2\theta$.
28. Evaluate $\lim_{x\to\infty}\sqrt{x}\,(\sqrt{x}-\sqrt{x-a})$.
29. If the ratio of the roots of $ax^2+bx+c=0$ be equal to that of the roots of $a'x^2+b'x+c'=0$ prove that $\frac{b^2}{b'^2}=\frac{ac}{a'c'}$.
30. Find the equation to the pair of straight lines joining the origin to the intersection of the straight line $y=mx+c$ and the curve $x^2+y^2=a^2$ prove that they are at right angles if $2c^2=a^2(1+m^2)$.
31. If A,B and C and the subjects of a universal set U. Then prove that

    i) $A\cup(B\cap C)=(A\cup B)\cap(A\cup C)$

    ii) $A\cap(B\cup C)=(A\cap B)\cup(A\cap C)$
32. Prove that $\sim(p\leftrightarrow q)\equiv(p\wedge\sim q)\vee(q\wedge\sim p)$.
33. Show that the roots of the equation $(a^2-bc)x^2+2(b^2-ca)x+(c^2-ab)=0$ will be equal, if either $b=0$, or $a^3+^3+c^3-3abc=0$.
34. If α and β and the roots of $px^2+qx+q=0$, prove that $\sqrt{\frac{\alpha}{\beta}}+\sqrt{\frac{\beta}{\alpha}}+\sqrt{\frac{q}{p}}=0$.
35. The opposite corner A and C of a square have the coordinates (-2, 7) and(4-3) find the equation of the diagonal BD.
36. The origin is a corner of square and two of its sides are $y+2x=0$ and $y+2x=3$ find the equation of the other two sides.
37. Solve the inequality $x-1<\frac{1}{3}(5-x)-1$
38. If $x\in R$ and a be any positive real number then prove that $|x|<a\Rightarrow -a<x<a$ and conversely.
39. Prove that the quadratic equation $ax^2+bx+c=0$ can not have more th

41. If the equation $x^2 + 2(k+2)x + 9k = 0$ has equal roots find k.

42. The sum of the roots of the equation
$\frac{1}{x+a} + \frac{1}{x+b} = \frac{1}{c}$ is zero prove that the product of the roots is $-\frac{1}{2}(a^2 + b^2)$

43. If the roots of the equation $x^2 + ax + c = 0$ differ by 1. Prove that $a^2 = 4c + 1$.

44. Find the angle between the line pair $2x^2 + 7xy + 3y^2 = 0$.

45. For what value of m, the equation $x^2 - mx + m + 1 = 0$ may have it's roots in the ratio 2:3?

46. If the roots of the equation $lx^2 + nx + n = 0$ be in the ratio p:q prove that
$\sqrt{\frac{p}{q}} + \sqrt{\frac{q}{p}} + \sqrt{\frac{n}{l}} = 0$

47. Find the angle between the lines $y - \sqrt{3}x - 5 = 0$ and $\sqrt{3}y - x + 6 = 0$.

48. Find the equation of the lines through the point (1, -1) and making an angle 60^0 with the line $\sqrt{3}x - y + 7 = 0$.

49. P and Q are two points on the line $x-y+1 = 0$ and are at distance 5 units from the origin find the area of the triangle OPQ.

50. Find the limiting values of $\lim_{y \to 0} \frac{(x+y)\sec(x+y) - x\sec x}{y}$

51. Show that the homogeneous equation of second degree always represents a pair of straight line passing through the origin. Also find the angle between them.

52. If the quadratic equation $x^2 + px + q = 0$ and $x^2 + p'x + q' = 0$ have a common root show that it must be either $\frac{pq' - p'q}{q - q'}$ or $\frac{q - q'}{p' - p}$.

53. Find the condition that one of the lines given by $ax^2 + 2hxy + by^2 = 0$ may be perpendicular to one of the lines given line $a'x^2 + 2h'xy + b'y^2 = 0$.

54. If p is the length of the perpendicular dropped from the point (a, b) on the line $\frac{x}{a} + \frac{y}{b} = 1$ prove that $\frac{1}{a^2} + \frac{1}{b^2} = \frac{1}{p^2}$

55. A function f(x) is defined by $f(x) = \begin{cases} x^2 - 1 & for \quad x < 2 \\ 2x & for \quad x = 2 \\ x + 1 & for \quad x > 2 \end{cases}$
Is the function continuous at $x = 2$? If not how can you make it continuous at x=?

56. Write the condition of perpendicularity of the line pair represented by $ax^2 + 2hxy + by^2 = 0$. Prove that the line pair joining origin to points of intersection of the curve $7x^2 - 4xy + 8y^2 + 2x - 4y - 8 = 0$ and the line $3x - y = 2$ are at right angles.

57. A function f(x) is defined below

58. $f(x) = \begin{cases} kx + 3 & for \quad x \geq 2 \\ 3x - 1 & for \quad x < 2 \end{cases}$, Find the value of k so that f(x) is continuous at $x = 2$.