

okay friends we have already discussed linear inequality in one variable now we shall discuss about linear inequality in two variable

so what is linear inequality in two variable suppose if a , b , c belongs to real number then $ax + by + c = 0$ is called linear equation in two variable and x and y whereas the inequalities $ax + by \leq c$, $ax + by > c$, $ax + by < c$ and $ax + by \geq c$ are called linear inequality in two variable x and y let us take an ordered pair and say this is solution of linear equation if this x , y satisfy in linear inequality into variable x , y or you can say if you put the value of x , y in linear inequality into variable the value must be true for example suppose we take $2x + 3y > 1$ and if you take an ordered pair $(1, 2)$ and we have to check whether this $(1, 2)$ is solution of this linear inequality or not

so put 2 into $1 + 3$ into 2 is equal to 7 which is greater than 1 $8 > 1$ sorry $8 > 1$ which satisfy the linear inequality $2x + 3y > 1$

so this $(1, 2)$ is solution for this inequality $2x + 3y > 1$ let us take another example say $x - y < 0$ and consider the value $(-1, 3)$ and put this value in $x - y < 0$

so $-1 - 3$ is equal to -4 which is again less than 0

so $(-1, 3)$ satisfy this in equation $x - y < 0$

so this $(-1, 3)$ is solution for this in equation $x - y < 0$

graphical solution graphical solution of linear in equation in two variables

so let us consider $x + y > 5$ this is linear equation in two variable and we just draw the graph of a line $x + y = 5$ this $x + y = 5$ will be called as associated equation for this in equation $x + y > 5$

so if you draw this the graph of this equation or this equation $x + y = 5$

so this is origin $(1, 2)$, $(3, 4)$, $(5, 1)$, $(2, 3)$, $(4, 5)$

so $x + y = 5$ means this line must passing through these two points now this line $x + y = 5$ divide this plane into two parts or we can say this plane contains infinitely many points and set of all these points are divided into three parts one part lying on this line

so the first set of points say x , y are those points which lying on these lines $x + y = 5$ means all these points satisfy this equation $x + y = 5$ and second set of points which satisfy in equation $x + y > 5$

so this is second set of points which satisfy this equation $x + y > 5$ and third set is all those point which satisfy $x + y < 5$

so this line this line $x + y = 5$ divide all the points in a plane into three different set one set of points which lies on this line $x + y = 5$ and second set lies on $x + y > 5$ and third set of points which lies in the region $x + y < 5$ and this is the picture

so we can say this $x + y > 5$ and $x + y < 5$ means this line $x + y = 5$ divide this plane into two half planes this is called half plane first and this is called half plane we can say this is half plane first and this is half plane second

so now we have to decide whether this plane is closed plane or open plane we have two types of plane closed half plane and open half plane

so if inequality is slack inequality means suppose you take example $2x + 3y < 1$ or $x + y > 3$

so if inequality sign of inequality is slack in equality it means the line associate line represented by associated equation will be full line

so when you draw the graph the line will be like this and if you consider in

equation $x + y < 2$ or $3x - y > 1$ then this inequality is strict inequality in this case the line will be half line dotted line

so this full line shows the plane close half plane contains this boundary line also and when a strict utility then bar half plane will doesn't contains this line

so that is why this is dotted line means this boundary is doesn't included and full line means boundary included now we have solution set

so solution set means the set of all ordered pair α, β of a real numbers which satisfy a given inequality is called a solution set of the given inequality it means suppose if you consider $3x - y < 2$ and all the point say if you consider a point α, β and if you put this $3\alpha - \beta$ and this is less than 2 it means α, β belongs to solute sunset and if this $3\alpha - \beta$ not less than 2 it means α, β does not belongs to solution set

so solution set we can say solution set is a set of all α, β such that α, β satisfy the inequality $a x + b y \leq c$ or $a x + b y \geq c$ or $a x + b y < c$ or $a x + b y > c$

so in this situation we can say α, β is the solution α, β belongs to solution set α, β does not belongs to solution set now what is solution reason the reason of the plane containing all the points which coordinates satisfy a given nuclei is called the solution reason of the inequality it means solution reason suppose we draw the graph of and inequality say this is $a x + b y \leq c$

so $a x + b y \leq c$

so this line divides this plane into two half plane have plane two we have two reason first region is represented by half plane one and second region represented by half plane two

so all the points either satisfied by half plane one or half plane two solution reason is a point

so set of points which satisfy either half plane one or half plane two

so suppose you satisfy this reason then this is called solution region solution reason for $a x + b y < c$ means if all the point which satisfy half plane two is called solid sand region how to find algorithm to find the solution set

so in order to find the solution set of a linear equation in two variable we follow the following algorithm

so first of all we have to write the associated equation

so let us take an example say $2x - y \geq 1$ or $2x - y > 1$

so associated equation associated equation is $2x - y = 1$

so this is called associated equation

so this is step one now step two put $y = 0$

so when you put $y = 0$ in associated equation we will get $x = 1/2$ that is we have a point $(1/2, 0)$ that is this $2x - y$ intersect x axis at $1/2, 0$ again put $x = 0$

so this implies $-y = 1$

so this implies $y = -1$ that is will intersect y axis at $(0, -1)$

so in this way we have two points $(1/2, 0)$ and $(0, -1)$ and by joining these two points we will get the line now

so this is x axis this is y axis this is origin and we have two points $(1/2, 0)$ and $(0, -1)$

so $1 \ 2 \ 3 \ 4$ and $1 \ 2 \ 3 \ 4$ minus 1 minus 2 minus 3

so point is 1 by $2 \ 0$

so this is 1 by 2 this is 1 by $2 \ 0$ 1 by two zero and another point is zero minus one and this is point zero minus one

so join these two points will get the line that is two x minus y equal to one now we have inequality that is two x minus y greater than equal to 1

so we have to define reason which region will be the solution reason or which region will be the feasible reason

so for this we just check then step step 3 draw the graph draw the graph of the line of the line two x minus y equal to one and step four that is shading of the region inequalities two x minus y greater than equal to one

so let us take an arbitrary point say one two let us take an rvt point one two and check whether this point satisfy the same equation or not

so two into one minus 2 is equal to 0 is not greater than equal to 1

so point one two doesn't lies in the solution region in the solution region of inequality $2x$ minus greater than equal to 1 now let us see the graph

so point one two this point is point one two it means this point one two lies in this region say this is half plane one and this is half plane two

so this point one 2 lies in half plane 2 and which does not satisfy this inequality $2x$ minus y greater than equal to 1 .

so this half plane 1 will be the solution reason it means we have to set like this this will be the solution

so in this way we can set which shows that this half plane will be the solution region for this n equation in place of arbitrary point we can also consider origin test origin test it means we have to just check whether origin lies in which region

so 2 into 0 minus 0 equal to zero and inequality is two x minus y greater than equal to one and zero is not greater than equal to one

so origin doesn't lies in the solution region but this origin test will not work when line passing through origin

so in this situation origin test does not work

so it is better to consider iv tree point and check whether that point satisfy the solution region or not and if satisfied then that half plane will be the solution region and if doesn't satisfy then its opposite half plane will be the solution region for the given in equation

so examples first is like this two x plus three y less than equal to six solve it graphically solution

so given in equation two x plus three y less than equal to six

so associated equation two x plus three y equal to six put y equal to zero

so we will give x equal to three

so that is three zero will lie on x axis or we can say this line two x plus three y equal to six intersect x axis at three zero now put x equal to zero implies y equal to two

so zero two will be the point on y axis or we can say this line two x plus three y equal to six intersect y axis at zero two now plot the graph of this associated equation

so this is x this is y x is 0

so point on x axis is $3 \ 0$ this is $1 \ 2 \ 3 \ 4 \ 1 \ 2 \ 3 \ 4$

so this point is $3 \ 0$ and point on y axis is $0 \ 2$

so this point is $0 \ 2$ now join these two points

so this will represent line two x plus three y equal to six and this line divide this plane into half plane one and half plane two now we have to define which half plane it will be the solution region for this we just take an

arbitrary point or you can say arbitrary arbitrary point test to define solution reason let us take a point say minus one two and given equation is $2x + 3y <= 6$.

so put this value of minus 1 and 2 in this in equation
so 2 into minus 1 plus 3 into 2 is equal to 4 which is less than six
so minus one two satisfied then equation satisfy the equation $2x + 3y <= 6$
it means now check whether minus where minus one two
so minus one minus two
so minus one two means this point will be minus one two minus one two
so since minus one two belongs to half plane two it means half plane two will
be the solution region

so we just said half plane two
so this sided portion this shaded region will be the solution reason for the
given in equation

so shaded reason half plane two will be the solution reason as minus 1 2
belongs to this region

so shader region will be solution another example solve graphically $2y + x >= 0$ solution

so associated equation for the given in equation will be $2y + x = 0$

so put $y = 0$ will give $x = 0$ it means this line passing
through origin this line passing through origin now put $x = 1$ this
implies $y = -\frac{1}{2}$

so we have two points on line that is zero zero and one minus one by two

so by joining these two points we can draw the graph of line represented by
equation $2y + x = 0$ x axis y axis zero we have two points that
is zero zero and one minus one by two one two 1 2 2 minus 1 and minus 2 this
is minus 1 minus 2

so point is one minus one by two

so this is minus one by two

so here we have point this point is one minus one by two now join these two
points will give the will give the equation of line that is $2y + x = 0$
to zero

so this is half plane one and this is half plane two

so again we check arbitrary point test arbitration point test let us consider a
point say one two now put this value $x = 1$ $y = 2$ in e in
equation $2y + x >= 0$

so 2 into 2 plus 1 equal to 5 which is greater than zero

so one two satisfy the inequation $2y + x >= 0$

so point one two must belongs to solution reason point one two belongs to
solution reason this will be \emptyset .

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so this point 1 2 belongs to solution region it means half plane 1 will be the
solution region half plane 1 will be the solution region

so set half plane 1.

so this will be the solution reason

so half plane one will be the solution region

so in this way we can find solution reason for the given in equation in two
variable now let us take another example

so before taking example we just discuss $x <= 3$

so $x <= 3$ implies minus three less than equal to x less
than equal to three it means this will give two inequality in one variable that

is x greater than equal to minus three and x less than equal to three
 so if you plot the graph of these two inequality
 so this is x this is y zero
 so its a associated equation will be x equal to minus 3 and x equal to 3
 so say this is 1 this is 2 this is 3 this is minus 1 minus 2 minus 3
 so x equal to minus 3 means this is a line which is parallel to y axis
 so this is a line x equal to minus 3 which is parallel to y axis and x equal to 3
 this is a line x equal to 3 which is again parallel to y axis now x less than
 equal to 3 means we have to consider this region and x greater than equal to
 minus 3 will be this region it means this will be the reason solution reason for
 mod x less than equal to
 so this region will be mod x less than equal to three
 so by using this concept we solve inequality solve graphically mod y minus x
 less than equal to three given mod y minus x less than equal to three
 so this implies minus 3 less than equal to y minus x less than equal to 3
 so again we split in two parts y minus x greater than equal to minus three and
 y minus x less than equal to 3 this implies x minus y less than equal to 3 and x
 minus y less than equal to minus 3 greater than equal to minus 3 x minus y
 greater than equal to minus 3
 so finally we have x minus y less than equal to 3 and x minus y greater than
 equal to minus 3 we have these two in equation let us take this is in equation 1
 and this is in equation 2
 so 4 1 x minus y less than equal to 3
 so we can write it as x by 3 minus y by 3 less than equal to 1 this implies x
 by 3 plus y by 3 less than equal to 1 the associated equation will be
 associated equation x by 3 plus y by 3 equal to 1
 so this equation in the form of x by a plus y by v equal to 1 means intercept
 form
 so this line intersect y axis x axis at three zero and y exit at zero minus
 three x this is y x is zero
 so we have x means 3 0 on x axis and 0 minus 3 y axis
 so 1 2 3 1 2 3 minus 1 minus 2 minus 3 minus 1 minus 2 minus 3
 so this is 3 0
 so this point will be 3 0 and this point will be 0 minus 3 join these two
 points 3 0 and 0 minus 3
 so this point is 3 0 and this point is 0 minus 3
 so equation x minus y equal to three now its solution reason
 so x minus y less than equal to 3 let us take an arbitrary point say 0 0
 so 0 minus 0 equal to 0 which is less than 3
 so origin 0 0 belongs to solution region of
 so x minus y less than equal to 3 it means here origin
 so this region will be the solution region 4 x minus y less than 3 again for 2
 x minus y greater than equal to minus 3
 so this implies x y minus 3 plus y by 3 x y minus 3 by y by 3 equal to 1 this
 is associated equation associated equation
 so point will be minus 3 0 on x axis and 0 3 1 y axis
 so minus 3 0 on x axis and 0 3 on y axis
 so draw join these two points will get the graph of x minus y equal to minus 3
 now again check origin test
 so zero zero
 so 0 minus 0 equal to 0 is greater than minus 3 which is true
 so 0 0 will lie in solution region of x minus y greater than equal to minus
 three it means the solution reason for this will be this reason
 so in both inequality the common solution reason will be this

so this region will satisfy both $x - y \geq -3$ and $x - y \leq 3$ or we can say that this region will satisfy this region will satisfy $|y - x| \leq 3$

so common shaded region will be the solution reason for $|y - x| \leq 3$ another example solve graphically $x - y \geq 1$ implies $x - y \leq -1$ and $x - y \geq 1$.

so when you plot the graph of these two in equation like previous problem so we will get the graph like this $x - y = 0$ $x - y = -1$

so associated equation will be $x - y = -1$ this will be $x - y = -1$ and $x - y = 1$

so this is $(-1, 0)$ and $(0, 1)$ it means this line passing through $(-1, 0)$ and $(0, 1)$

so from $(-1, 0)$ and $(0, 1)$

so graph of this line will be like this

so this will represent $x - y = -1$ and associated equation for this in equation is $x - y = 1$

so $x - y = 1$ and $x - y = -1$

so this line passing through $(1, 0)$ and $(0, -1)$ $(1, 0)$ $(0, -1)$ $(-1, 0)$ $(0, 1)$

so graph of this line $x - y = 1$ now we have to check which part will satisfy this in equation $x - y \leq -1$

so let us check say origin origin test

so zero zero

so for $x - y \leq -1$

so $0 - 0 \leq -1$ is false

so origin doesn't lie in this plane

so this will be the solution region similarly for $x - y \geq 1$ $0 - 0 \geq 1$ again false

so origin does not lie in the reason it means this will be the solution reason so this said portion will be the solution reason

so said portion will be the solution reason for $x - y \geq 1$ ok thank you will discuss in you