welcome to lecture four on inverse trigonometric functions in the last lecture we had derived some relations between these inverse trigonometry functions
 so we will conclude with that and will solve some new problems
 so just to recap where we left from
 so in the last lecture we had actually derived this formula for the sum of the tan inverses of two different values x and y and we had shown that if the product x y is less than one then tan inverse x plus tan inverse y is tan inverse of x plus y over one minus x y and similarly for the other two cases
 so a natural question then which can be asked is what if we have to compute something like sine inverse x plus sine inverse y will it be possible to use the tan inverse a plus tan inverse b type formula and derive the the value of sine inverse x plus sine inverse y and that is possible
 so the way to do that would be to first convert for a given x to convert sine inverse x into the form tan inverse of something where the something would obviously depend on x and similarly convert sine inverse y also into tan inverse of something
 so then we just have to compute tan inverse a plus tan inverse b for which we can actually use ah this formula
 so taking that idea forward we had in the last class ah derived the conversion formulas between sine inverse and tan inverse
 so what we had shown was that for any x such that mod of x is less than equal to one sine inverse x is equal to tan inverse of x upon square root of one minus x square where this is the positive square root and the reverse formula was for any x real we had also shown that tan inverse x is equal to sine inverse of x over square root of one plus x square where this is again the positive square root
 so just like the conversion between sine inverse and tan inverse it is also possible to derive the conversion formulas between cos inverse and tan inverse between cot inverse and tan inverse and also between cosec inverse and tan inverse and between sec inverse and tan inverse
 so in the interest of time we are not going to derive all of them but i will at least go ahead and derive the conversion formula between cos inverse and tan inverse
 so the the idea is that suppose if we are given a value of x which is whose modulus is less than equal to one then we need to find this unknown value here
 so that cos inverse of x is equal to tan inverse of this value
 so this is what has to be derived
 so we start with by saying that suppose cos inverse x is equal to theta then since the range set of the cos inverse function is the closed interval 0 to pi it follows that this theta must belong to the closed interval 0 to pi now suppose that if x is greater than equal to zero
 so we are going to take two cases
 so x is either ah greater than equal to zero and less than one or it is less than 0 but greater than minus 1.

 so if x is greater than equal to 0 then from the graph of cos inverse which we have already done in one of the previous lectures we know that the theta has to belong theta is cos inverse of x theta has to belong to the interval 0 to pi over 2 since we want to find this unknown thing if you apply tan function on both the sides of this equation what you will get is tan of cos inverse x is equal to this unknown ah thing that we are supposed to find
 so that is why we try to find the value of tan of cos inverse x which is tan of theta but from here we know that x if we take cos if we apply the cos function on both the sides of this equality what we are going to get is x is equal to cos

theta
  so now this tan theta can is equal to sin theta over cos theta but cos theta is x
  so the denominator is x now when theta belongs to the interval 0 to pi by 2 we know that sine theta is positive valued
  so therefore we can write it sin theta as the positive square root of 1 minus cos square theta of course this follows from the fact that sine square theta plus cos square theta is equal to one for any theta and we take the positive square root here which is further equal to square root of now we use the fact that cos theta is actually x
  so this becomes square root of one minus x square over x and further
  so finally what we get is that if x is greater than equal to zero then tan of theta where theta is cos inverse x is equal to square root of one minus x square over x we further know that this theta actually belongs to the interval zero to pi by two and this interval zero to pi by two is actually a subset of the interval minus pi by two to plus pi by two
  so essentially the interval zero to pi by two to which this theta belongs is actually a subset of the range set of the tan inverse function
  so because theta
  so essentially theta belongs to the
  so theta belongs to the range set of the tan inverse function and because theta belongs to the range state of the tan inverse function it follows that theta which is actually cos inverse x is equal to tan inverse of square root of one minus x square over x but this is only true for x greater than equal to zero
  so again repeating it the the the reason why
  so this for if if theta were not belonging to this set then from starting from this statement we cannot say that this is true
  so the only reason we say that theta is equal to tan inverse of this quantity the reason why that is true is because theta is belong to the range set of tan inverse range set of tan inverse and then we take the negative values of x
  so if x is less than zero and of course greater than equal to minus one then we know that theta equal to cos inverse x will belong to the interval pi by 2 to pi
  so this follows from the from the definition of the cos inverse function because x is between minus one and zero theta will obviously belong to the interval pi by two to pi and then tan theta will be equal to sine theta over cos theta which is equal to again now in this interval when theta belongs to pi by 2 to plus pi what we have is that sine theta is still positive
  so we can express sine theta as the positive square root of one minus cos square theta over cos theta but we already know that cos theta is x
  so this becomes equal to square root of one minus x square over x where this is the positive square root
  so we again have tan theta equal to square root of 1 minus x square over x but this time we know that because x is negative theta equal to cos inverse x it belongs to this set pi by two to pi but the problem is that this set is this set is not a subset or this set does not have any point in common with the range set of tan inverse
  so essentially here we have a case that if theta belongs to this set then theta does not belong to the range set of tan inverse and therefore we cannot write
  so we cannot write that theta is equal to tan inverse of square root of one minus x square over x
  so for this case where x is negative this statement is not true
  so this statement is not true and therefore we need to ah apply some shift or some change to theta
  so that after applying that shift the new value of theta belongs to the range

set of tan inverse now we know from the property of the tan function that the tan function is periodic with a period equal to pi and therefore we know that if we subtract pi from this theta essentially what we know is that tan theta is the same as tan of theta minus pi and the good thing is that because theta belongs to the set pi by two to pi theta minus pi will obviously belong to

 so theta minus pi is going to belong to the set minus pi by 2 to 0 and this set minus pi by 2 to 0 is a subset of the range set of tan inverse

 so essentially what we have now is that theta minus pi is going to be belong to the range set of tan inverse

 so if you if you go back what we have what we see is that the original theta did not belong to the range set of tan inverse but by simply shifting it by pi we have theta minus pi belonging to the range set of tan inverse and since tan theta minus pi is equal to tan theta what we have now is that

 so tan of theta equal to tan theta minus pi is equal to square root of one minus x square over x we know that theta minus pi belongs to the range set of tan inverse and therefore we can write that theta minus pi equals tan inverse of square root of one minus x square over x which then implies that theta is equal to pi plus tan inverse square root of one minus x square over x and therefore but this then is only this is only true when x is negative and therefore finally combining both the results for the positive and negative values of x we finally have this conversion formula that cos inverse x is equal to if x is greater than equal to zero then it is equal then cos inverse x is equal to tan inverse of square root of one minus x square over x otherwise it is equal to pi plus tan inverse of square root of one minus x square over x

 so we next derive the reverse ah inverse relation which is that for any given ah x real valued tan inverse x is equal to cos inverse of something

 so we have to derive an expression for this something such that tan inverse x is cos inverse of this something

 so again ah we start with by substituting tan inverse x to be theta and of course theta has to belong to the open interval minus pi by two to plus pi by two

 so this is the range set of the tan inverse function and since ah we are interested in finding this unknown quantity here we would actually be interested because if we apply the cos function on both the sides of this equality what we will get is cos of tan inverse x equal to this unknown thing

 so are therefore interested in evaluating cos of tan inverse x which is cos of theta which is equal to 1 over secant theta now when theta belongs to minus pi by 2 to plus pi by 2 secant of theta is non negative value and therefore we can write it as one over the positive square root of sec square theta which can be further written as one over square root of now we know the identity that for any angle theta sec square theta is equal to one plus tan square theta

 so we are going to use this error

 so we write it as one plus tan square theta and from here we know that x is equal to tan theta because we applied tan function on both the sides we get x equal to tan theta

 so this then is essentially one over root of one plus x square

 so we have cos of tan inverse x equal to this quantity but from here can we write that tan inverse x is equal to cos inverse of this quantity

 so well we can only do that if we know that this value here which is theta

 so cos theta is equal to this

 so we can only write that theta is equal to cos inverse of one over root of one plus x square

 so this is valid if and only if this angle theta belongs to the closed interval zero to pi

so the zero to pi is actually the range set of the cos inverse function
so only if this theta belongs to the range set of the cos inverse function only then we can write theta to be equal to cos inverse of this quantity otherwise we cannot write this
so and this is not true in general in this case because if you see theta here being in the false in the range set of tan inverse and therefore it belongs to this set and this set minus pi by 2 to pi by plus pi by 2 is definitely not entirely contained in the range set of the cos inverse function
so so therefore we cannot say that always we cannot always say that theta which actually belongs to this set will also belong to this set because these two sets i mean because this set ah minus pi by two to plus pi by two is not contained within the set zero to pi
so therefore we divide the problem this problem into two cases we first take the scenario where x is greater than equal to zero because when x is greater than equal to zero then we know from the graph of the tan inverse function that tan inverse theta equal to tan inverse x
so theta is going to therefore belong to the set zero to pi by two
so when x is greater than equal to zero theta equal to tan inverse x belongs to the interval 0 to
so this will be the open interval
so open from the open at pi by 2 and then now since ah theta is going to belong to this and we also know that zero to pi by two is of course it ah this particular set is a subset of zero to pi now this is the range set of the cos inverse function and therefore when x is greater than equal to 0 theta belongs to the range set of cos inverse and hence since cos of theta is equal to one over square root of one plus x square and theta belongs to the range set of cos inverse it follows that theta which is tan inverse x will be equal to cos inverse of one over root of one plus x square but this is only true when x is greater than equal to zero because when x is greater than equal to zero theta belongs to the range set of cos inverse and therefore from this equation we can straight away imply that theta is equal to cos inverse of one over the positive square root of one plus x square we next take the other case where x is negative now when x is negative then theta equal to tan inverse x will belong to the set minus pi by two to zero this is because this again is from the graph of the tan inverse function but in this case ah we clearly see that theta does not belong to 0 to pi
so essentially in this case theta does not belong to the range set of cos inverse and therefore we cannot conclude
so therefore in this case this statement will no more be true because for the case of x negative your r theta is not belonging to the range set of cos inverse and therefore then we must try to shift this theta in in such a manner in such a manner that this theta belongs to the range set of cos inverse but we should do it in such a way that the theta belongs to the range set of cos inverse now we know that the range state of course inverse is zero to pi
so if we if we increase theta ah by pi
so if we consider theta plus pi first of all what we see is that if theta belongs to this set then theta plus pi is going to belong to pi by 2 to pi and this set is obviously a subset of the range set of cos inverse and therefore although theta did not although theta did not belong to the range set of cos inverse but theta plus pi will
so theta plus pi belongs to the range set of cos inverse additionally cos of theta plus pi is equal to minus cos of theta but we know that cos theta is one over square root of one plus x square
so then this is equal to minus one over square root of one plus x square where

again this is the positive square root
 so cos of theta plus pi is equal to minus one over positive square root of one plus x square and since theta plus pi belongs to the range set of cos inverse we can immediately say that theta plus pi is equal to cos inverse of minus one over positive square root of one plus x square and from here it can be concluded that theta is equal to minus pi plus cos inverse of minus one over positive square root of one plus x square
 so both these cases can be summarized now and what we finally have is that for any value of x which is real valued for any value of x which is real valued tan inverse x is given by this formula
 so when x is greater than equal to 0 then tan inverse x
 so when x is greater than equal to zero then tan inverse x is equal to cos inverse of one over positive square root of one plus x square but if x is negative then tan inverse x is equal to minus pi plus cos inverse of minus one over positive square root of one plus x square
 so we just concluded with the ah conversion formula between cos inverse and tan inverse and similar type of formulas can be derived between cot inverse and tan inverse for example if we are given cot inverse of x we can convert that into ah of the into something an expression which consists of the tan inverse function like this ah vice versa if we are given tan inverse of something then that can also be alternatively be written as cot inverse of some other value
 so that is here and further similar type of conversion formulas can be derived between tan inverse and cosecant inverse and also between tan inverse and secant inverse
 so the primary use of this formulas will be to help us in computing any general expression of the forms you know sine inverse of x plus lets say secant inverse of y or sine inverse x plus cos inverse y
 so the the way to do that would be as i mentioned earlier that if we have to compute something like sine inverse x plus secant inverse y then we basically convert using the conversion formula we convert this thing into tan inverse of some value and using the conversion formula between tan inverse and secant inverse we convert this to tan inverse of some other value note of course that this value here will is a function of x and similarly this value here is a function of y and then we can use the tan inverse a plus tan inverse b type formula to write this in terms of tan inverse of some other value
 so this finishes our discussion on the properties of inverse trigonometry functions and the relations between this these different inverse trigonometry functions
 so in the remaining part of this lecture and also in the next lecture we are going to discuss several problems
 so here is the first problem
 so we are asked to compute the value of this expression
 so which is cotangent of some angle and that angle is a sum of caught inverses of 23 different values
 so if we just look at this expression here and let us try to derive that first
 so we have cot inverse of 1 plus summation a equal to one to n two k which equals cot inverse of one plus now this thing inside this summation is essentially two multiplied by and one plus two all the way till n and that can be further simplified to 1 plus 2 times now this thing inside the bracket is nothing but the sum of the first n natural numbers which is equal to n times n plus one over two
 so we therefore have this to be equal to cot inverse of one plus n times n plus one and suppose that ah we were to define let us say that cot inverse of one plus n times n plus one equals theta then of course we know that from the range

of the cot inverse function that theta will obviously belong to the open interval 0 to pi which is the range set of the cot inverse function then applying the cot ah function on both the signs of both the applying the cot function on both the sides of this equality we get cot of theta equal to one plus n into n plus one and therefore tan of theta equals one over one plus n into n plus one and this expression here is nothing but can also be simplified to n plus 1 minus 1 minus n n plus 1 minus n over 1 plus n plus 1 into n
 so this expression over here reminds us of the formula tan of x minus y equals tan x minus tan y over one plus tan x tan y
 so here essentially ah this n plus one is tan x n is equal to tan y and then if we use the substitu use that substitution then we basically get this expression here
 so therefore we can write this whole thing tan theta also as equal to tan of tan inverse n plus 1 minus tan of tan inverse n over one plus tan of tan inverse n plus one times tan of tan inverse n
 so this is of the form tan x minus tan y divided by one plus tan x times tan y which is but this is nothing but tan off
 so here this is our x and this is y
 so x is tan inverse of n plus one y is tan inverse of n
 so therefore what we get is that tan theta is
 so this essentially is this whole expression here is nothing but tan of x minus y where x is equal to tan inverse of n plus one and y is equal to tan inverse of n
 so we get tan theta to be equal to tan of x minus y which is tan inverse n plus one minus tan inverse of n
 so this is what we have got
 so far further we also know that because this n are natural numbers and these n are also and therefore all n and n plus 1 are greater than 0 and therefore it follows that since n and n plus 1 are greater than 0 it follows that tan inverse n plus one must belong to the interval zero to pi by two and similarly tan inverse of n must also belong to the interval zero to pi by two and further and therefore ah it is clear that their difference tan inverse n plus one minus tan inverse of n must belong to the interval minus pi by two to plus pi by two and remember that this is nothing but the range set of the tan inverse function
 so essentially what we here have here is that if you remember when we ah started with we had
 so here we initially had that theta will belong to 0 to pi because this is what this is what is the range set of cot inverse but we for now further know that tan theta is positive and therefore adding this fact along with the fact that theta must line the interval zero to pi what we can say is that theta must therefore belong to the interval 0 to pi by 2
 so this is because tan theta is positive value and additionally the fact that theta must belong to 0 to pi
 so if we look at the the graph of the tan function
 so so this is from one of the previous lectures
 so we see that
 so this is this is the value of tan x is on the vertical axis and x is on the horizontal axis
 so the the curve in marked with blue is the curve for the tan x function
 so as we can see here whenever x is between 0 to pi by 2 the value of tan x is positive but then between pi by 2 and pi the value is this value here this part of the curve here this is negative and we are said that the theta is going to only belong to this interval only from here to here and further we know that tan tan theta must be positive and therefore it is clear that theta must belong to

this interval zero to pi by two
so we know that theta must belong to zero to pi by two
so in
so let us focus on this equation now
so theta must belong to zero to pi by two and additionally this ah difference angle here we just showed that this angle also belongs to minus pi by two to plus pi by two but if we if we remember the graph of the tan inverse function
so this is the graph of the tan inverse function
so we have x on the horizontal axis and tan inverse x on the vertical axis now we can clearly see that the tan inverse function is a monotonically increasing function it has been plotted in red
so its a monotonically increasing function and therefore because n plus 1 is greater than n it obviously follows that tan inverse of n plus one will be greater than tan inverse of n and from here we can easily say that therefore using this fact in our previous equation we can say that this quantity over here is
so this quantity here is greater than equal to 0 and further we know that in fact it should be strictly greater than 0 because n plus 1 and n can never be the same and further we had shown that this entire value has to belong to this set and therefore by combining this fact ah with the fact that this value belongs to this set we can also tell that the value tan inverse n plus one minus tan inverse n must belong to the interval zero to pi by two
so now what we have is that ah we have a situation where tan theta equal to tan of ah tan inverse n plus one minus tan inverse n we know that theta must belong to zero to pi by two the open interval and we also know that this value tan inverse n plus one minus tan inverse n should also belong to the same interval same open interval zero to pi by two and these two values tan of theta and tan of this angle are the same now because we know that ah again going back to the curve for the tan function we know that in the interval zero to pi by two as we can see the tan function is a monotonic function its a monotonically increasing function and therefore let us say that if this is theta then then this value over here is tan of theta since tan is a monotonically increasing function in the interval zero to pi by two it follows that if tan theta were to be equal to tan of this angle the only way that is possible is if theta itself is equal to tan inverse of n plus one minus tan inverse n
so this is what must be true and therefore what we have shown
so far is that cot inverse of one plus n into n plus one is is actually equal to tan inverse of n plus 1 minus tan inverse of n and then further going ahead we saw that we have just simplified one of the terms of this outer summation
so now if we replace all these terms by this expression
so this summation will turn out to be summation of n equal to one to twenty three cot inverse one plus summation k equal to one to two n two k is equal to summation n equal to one to twenty three now if we replace all these cot inverses by the expression tan inverse n plus one minus tan inverse of n but then if we just expand this big summation we will starting with n equal to one the first term is tan inverse two minus tan inverse one the second term is tan inverse three minus tan inverse of two and likewise the last term is going to be tan inverse of twenty four minus tan inverse of 23 but what we are going to see here is that there is going to be lot of cancellations for example tan inverse 2 will get cancelled here and similarly tan inverse 3 will get cancelled with ah because the the just previous term here the the twenty second term in the summation is going to be tan inverse twenty three minus tan inverse of twenty two
so this tan minus tan inverse will get cancelled here and then similarly ah

minus tan inverse twenty two will get cancelled with the the tan inverse twenty two in the twenty first term

so and similarly this will also get cancelled from with the tan inverse three in the third term

so ultimately what is going to remain is tan inverse of twenty four minus tan inverse of one and to compute ah tan inverse of 24

so therefore we finally have to compute essentially what we have done

so far is that we have shown that cot of summation n equal to one to twenty three cot inverse of one plus summation k equal to one to two n of two k

so we have shown that this thing inside the in the argument of the chord function we have shown that that is equal to tan inverse of twenty four minus tan inverse of 1.

so now we need to simplify this further because the idea should be to actually express this whole thing as tan inverse of something

so that we can then have cot of tan inverse something and then we have already seen this conversion formula between cot and tan

so that should help us

so ah for this thing we if you remember in the starting of this class today we saw we were actually revisiting some of the earlier derived results

so one of the results was this expression here that tan inverse x plus tan inverse y is equal to tan inverse of x plus y over one minus x y if x y is less than one

so in our case what is happening is that we need to compute tan inverse of twenty four minus tan inverse of one which can now because the tan inverse is an odd function i can write minus tan inverse of one as plus tan inverse of minus one this is because the tan inverse is an odd function what i mean to say is that for any x tan inverse of minus x equals minus of tan inverse of x and we have shown this identity in a previous lecture

so now this term therefore equals to tan inverse of 24 plus tan inverse of minus 1.

so finally we have this expression in the form tan inverse x plus tan inverse y

so so this is x and this is y and then here we see that x into y is minus twenty four and minus twenty four

so out of all these cases the case that we have at hand is x y equal to minus 24 which is less than one

so we have to use this case here and therefore this expression will be equal to tan inverse of x plus y

so x plus y is minus 1 divided by 1 minus x into y

so x is twenty four and y is minus one

so this is the final answer what we get is tan inverse of twenty three over twenty five

so therefore now what we have is that this is equal to tan inverse of twenty three over twenty five and hence this whole thing is equal to cot of tan inverse of twenty three by twenty five

so the final answer will be cot of tan inverse of 23 over 25 and this can also be simplified further because now suppose lets say that let us say that tan inverse of 23 by 25 is theta then obviously it follows that 23 by 25 is equal to tan of theta because we can take the apply the tan function on both the sides of this equality of this equation and then we get this thing but from here it follows that cot of theta is equal to one over tan theta which is twenty five over twenty three but then this is nothing but cot of theta because theta is tan inverse twenty three by twenty five and now we have just seen that this is

exactly equal to twenty five over twenty three
 so this is the final answer that court of this big summation is equal to twenty five over twenty three let us take one last problem before we conclude this ah lecture
 so here
 so we have to find the value of x such that mod of x is between zero and square root of two and that x satisfies this trigonometric equation
 so before we proceed further we see that there are two infinite series
 so we need to simplify them and then maybe we can go further
 so we take the the first series ah which is inside the sine inverse
 so the first series is x minus x square over two plus x cube over four minus
 so most likely the minus x four over eight plus and
 so on
 so we can take x as the common factor outside and then we get 1 minus x over 2 plus x square over 4 minus x cube over eight and
 so on and that can be written as x times 1 plus minus x over 2 plus minus x over 2 whole square plus minus x over two cube and
 so on
 so immediately we see that we have a geometric ah series over here and then but then we need to find out whether this series is going to converge or not
 so we are given that if we go back to the statement in the question we are given that mod of x is less than square root of two
 so if mod of x is less than square root of two that implies that mod of x has to be also less than two which then implies that mod of x over two is less than one and that also means that mod of minus x over two is also less than one
 so we
 so see that the the ratio between ah the this term and the next term and also between this term and its next term is minus x over two and from here we know that minus x over two has an absolute value which is less than one
 so since
 so that basically from there we can conclude that this series is going to converge and it will converge to the value
 so we already have this x from here and then the series is going to converge to 1 upon 1 minus minus x over 2 which is x upon one plus x over two
 so now we know that this infinite series is equal to x upon one plus x over two next we take the other series which is inside the argument of the cos inverse function
 so this other sequence which is the argument of the cos inverse function is x square minus x four over two plus x six over four and
 so on which can be written as x square since x square is common to all the terms times 1 minus x square over 2 plus x 4 over 4 and
 so on which is equal to x square times one and then plus minus x square over two plus minus x square over two whole square and
 so on
 so even in this case we see that there is again another geometric progression and but we still need to ah find out whether this infinite sequence is also going to converge or not now we are given that mod of x is less than square root of two
 so what that implies is that x square is less than two and therefore x square over two is less than one and this basically implies that the modulus of minus x square over two
 so minus x square by two is the ratio between the nth term and the n minus one at term in this geometric series and from here we know that the absolute value of this ratio is less than one and therefore even this sequence is going to

converge and therefore this whole expression this whole sequence is going to converge to the value x square times one upon one minus minus x square over two which is equal to x square upon one plus x square over two

so let us make a note of that

so what we have shown just now is that this other sequence also in the argument of the cos inverse function converges to x square upon one plus x square upon two we next have to find values of x such that mod of x is less than square root of two and sine inverse of x upon one plus x by two plus cos inverse of x square upon one plus x square by two is equal to pi by two

so lets denote this thing by alpha and the other ah term which is the argument of the cos inverse function by beta

so essentially what we have here is that sine inverse alpha plus cos inverse beta is pi by two and that is the same as saying that sine inverse alpha is equal to pi by 2 minus cos inverse beta lets apply the sine function on both the sides of this equation

so when we apply sine to the left hand side we get sine of sine inverse alpha which is equal to alpha on the right hand side we get sine of pi by 2 minus cos inverse beta but we know that for any angle theta sine of pi by 2 minus theta is equal to cos of theta and therefore this right hand side is equal to cos of cos inverse beta which of course is equal to beta and therefore if x has to satisfy this equation this must be equal to this hence what we finally have that is that x must satisfy the equation x upon one plus x by two equals x square upon one plus x square over two now since ah mod of x is less than square root of two it follows that both these denominators will never be zero and therefore from here it implies that x into one plus x square over two equals x square into 1 plus x over 2 and then with a little algebraic simplification we get x plus x cube over 2 equals x square plus x cube over 2 and of course x cube over 2 is on there on both the left and the right hand side and hence what we finally get is that x into x minus 1 equals 0.

so x can be either 0 or it can be 1 but if we go back to the question it was also stated that mod of x must be greater than zero and it must be strictly less than square root of two since it must be strictly greater than zero x equal to zero is obviously not a feasible solution and therefore the only feasible solution is x equal to 1 because x equal to 1 is the the modulus of x equal to 1 is less than root 2 and also that x equal to 1 satisfies this equation

so the final answer to this question is that the only value of x with modulus less than root two is and which also satisfies this equation is x equal to one

so the final answer is x equal to one

so with that we will end this lecture in the next lecture we will take up some more interesting problems thank you you