welcome student today our topic is quadratic equation it is lecture number two in last class we have discussed about the polynomial and in polynomial we have discussed the linear polynomial quadratic polynomial and cubic polynomial and by quadratic polynomial after that we have discussed quadratic equation in which we have find out the root of the quadratic equation after that ah we discussed about the nature of the roots without finding the roots actually roots of the quadratic equation

so in this class we shall start the the class with formation of quadratic equation suppose alpha and beta are the roots of the quadratic equation these are the roots of the quadratic equation now the equation will be suppose alpha is the root

so x equal alpha will satisfy the quadratic equation and x minus alpha will be the root will be the factor of quadratic equation a x square plus b x plus c equals to zero because alpha is the root

so x minus alpha is the factor of this quadratic equation and beta is also the root of the quadratic equation to x

so x equal beta and x minus beta will also be the factor factor of a x square plus b x plus c now x equal l x minus alpha and x minus beta are the factor of the quadratic equation

so x minus alpha and x minus beta must be equals to zero now we shall multiply x square minus beta x now minus alpha x plus alpha beta this can be written as x square minus alpha plus beta of x plus alpha beta equals to zero now the quadratic equation will be x square minus sum of roots because alpha and beta are the roots of the quadratic equation

so alpha plus beta will be the sum of root x square minus sum of roots of x plus product of root equal to zero suppose alpha and beta will be the roots

so you b can find out the equation by taking the sum of the roots and product of the roots now let us take an example suppose there are two roots of the quadratic equation the first root is two plus root three and the second root is two minus root three suppose there are two roots of the quadratic equation and these roots are in a rational form

so we can find out the equation of the quadratic equation now the sum of root will be alpha plus beta equal to plus root 3 plus 2 minus root 3 it will be 4 now we can find out the product of the root it will be 2 plus root 3 multiplied by 2 plus 2 minus root 3 now we can multiply these two it will be a square minus b square it will be four minus three it will be one now the sum of the root will be four and the product of root is one now we can find out the equation quadratic equation will be x square minus sum of root packet x plus product of root equal 0 x square minus the sum of root is 4 and the product of root is one

so equation will be x square minus four x plus one equals to zero this will be the quadratic equation now we can take another example in which roots are imaginary suppose roots are two plus i and the second rule is two minus i these two roots are complex

so we can find out the quadratic equation sum of root is alpha plus beta equal two plus i plus two minus i the sum of root will be four now we can find out the product of the root alpha beta equal two plus i multiplied by two plus i minus two minus i now we can multiply two square minus iota square it will be four plus one which is five now the sum of the root is four and the product of root is five now quadratic equation will be x square minus alpha plus beta of x plus alpha beta equal zero now it will be x square minus the sum of root is four and product of root is five equals zero now that's our quadratic equation now we will discuss a transformation of quadratic equation transformation of quadratic equation suppose a x square plus b x plus c equals 0 is an is a quadratic equation now we want to get a quadratic equation whose root is reciprocal of the

roots of this given equation now because roots are reciprocal now we can put x equal one upon y if we put x equal one upon y then we will get the root of the quadratic equation which is reciprocal to the given equation now put x equal one upon y the equation will be a one over y two the whole square plus b one over y plus c equals to zero now equation will be s a over y square plus v over y plus c equal zero now multiplying by y square both sides it will be y square a over y square plus v over y plus c zero into y square it will be a plus b y plus c y square equal zero now the quadratic equation will be c y square plus v y plus a equal zero now this is the quadratic equation whose roots are reciprocal of the given quadratic equation a x square plus b x plus c equal zero now let us take an example of that suppose this is the quadratic equation x square plus seven x plus twelve equals to zero now we can find out the root of that quadratic equation but we are transforming this equation and we want to get that equation whose roots is reciprocal of that root without finding the roots of the quadratic equation

 so we will put x equal one over y now the equation will be one over y square plus seven of one of power by plus twelve equal zero and it will be one over y square plus seven over y plus twelve equals to zero after multiplying by y square it will be twelve i square plus seven y plus one equal zero now let us check the root of the quadratic equation r reciprocal to each other first of all we shall find out the root of the quadratic equation x square plus 7 x plus 12 equals to 0 after that we will find out the root of the quadratic equation twelve y square plus seven by plus one equal zero and find out what is the relation between the roots now the first equation is x square plus seven x plus twelve equals to zero let us try to factorize it x square plus four plus three of x plus twelve equals to zero by splitting of middle term x square plus four x plus three x plus twelve equals to zero x plus four x of x plus four now we are taking three in that x plus four equals zero it will be x plus four and x plus three equal zero now the roots of this quadratic equation is minus three and minus 4 now we have find out found out the root of this equation is minus 3 and minus 4 now we shall find out the root of this quadratic equation the root of this quadratic equation should be 1 upon minus 3 and 1 upon minus 4 let us try to find out the root of the twelve y square plus seven by plus one equal zero twelve hundred twelve now we are splitting the middle term twelve i square factorized ah factor of twelve is four into three

 so it will be four plus three of y plus one equals zero twelve i square plus four y plus three y plus one equal zero now we can take four y in first two it will be three y plus one now we can take plus one three y plus one equals zero it will be three y plus one and four y plus one equal zero now the roots will be minus one over three and minus one over four the root of this quadratic equation is minus one over three and minus one over four which is reciprocal of the given equation now ah we shall transform another quadratic equation whose roots are negative of the roots of given quadratic equation suppose a x square plus b x plus c equals zero this is our quadratic equation now we will find out another equation whose roots are negative of given quadratic equation

 so put x equal minus y now new equation will be a of minus y to the whole square plus b of minus y plus c equal zero now the new equation will be a y square minus b y plus c equal zero now it is the transform equation let us understand why another example ah suppose x square minus three x plus two equal zero is a quadratic equation and we want to get that equation with the whose roots is reciprocal of the negative ah sorry ah whose roots is negative of the given quadratic equation now we shall put x equal minus y now the transform equation is transform quadratic equation will be minus y to the whole square minus three of minus y plus two equal zero now it will be y square plus three y

plus two equals zero now we shall check the roots now first of all we will find out the root of x square minus three x plus two and then after that we will find out the root of y square plus three by plus two equals to zero because because we will check whether the roots are negative or not now the first equation is x square minus three x plus two equal zero we will try to factorize it x square minus two plus one of x plus two equal zero x square minus two x minus x plus two equal zero now try to take out the common x of x minus 2 here minus 1 of x minus 2 equals 0 it will be x minus 2 x minus one equal zero now the roots will be x equal one and two now we shall find out the roots of the transformed equation which is which is y square plus three by y square plus three y plus two equal zero try to factorize it y square plus two plus one of y plus two equals to zero y square plus two y plus y plus two equal zero now the roots will be now when we will take out ah y from that y plus two it will be and now we can take plus one by plus two it will be y plus two y plus one now the roots will be y equal minus two and minus one now the roots of the first quadratic equation is one and two and the roots of this transform quadratic equation is minus 1 and minus 2 which are negative to the first quadratic equation
 so we can say that we can find out the quadratic equation whose roots are negative to the given quadratic equation now we will discuss the transform equation whose roots are square of the given quadratic equation suppose a x square plus b x plus c equal zero is the quadratic equation now we shall find out the root of that another quadratic equation by putting x equal under root y now equation will be a under root y to the whole square plus b under root y plus c equal zero it will be a y plus v root by plus c equal zero it can be written as a y plus c equal minus v of root by squaring both sides it will be a y plus c to the whole square equal b square of y now the equation is a square y square plus c square plus 2 ac of y equal v square y now the quadratic equation will be a square y square plus two ac minus v square of y plus c square equal zero now this is the transparent quadratic equation let us take an example of that suppose x square plus seven x plus twelve equals to zero is in quadratic equation now we shall find out the transform quadratic equation by put x equal under root y now it will be root y to the whole square plus seven root of y plus twelve equal zero now it will be y plus seven of root by plus twelve equal zero it will be y plus twelve equal minus seven root of y both side it will be y square plus 144 plus 24 of y equal 49 y now the quadratic equation will be pi square minus 25 of y plus 144 equals to zero now let us check the roots of these two quadratic equation x square plus 7x plus 12 equals to 0 and y square minus 25 by plus 144 equals to 0 first of all we will find out the root of the first quadratic equation x square plus 7 x plus 12 equals to 0 that is our first quadratic equation now we can factorize by splitting of middle term x square plus four plus three of x plus twelve equals two now it will be x plus four x plus three equals to zero the roots will be minus three and minus four now ah we will find out the root of y square minus twenty five by plus one forty four equals to zero now root will be y square minus sixteen plus 9 of y plus 144 equal 0 it will be y square minus 16 by minus 9 y plus 144 equals to 0 now take y as common y minus 6 y of y minus 16 now we can take out minus 9 in last two it will be y minus sixteen y minus sixteen and y minus nine equal zero the root will be y equals to sixteen and y equals to nine now the root of this the first quadratic equation is minus 3 and minus 4 and the root of this equation is 9 and 16 which is square of the given quadratic equation now now we shall discuss the quadratic equations whose roots are common
 so let us take two quadratic equations the first quadratic equation is a one x square plus v one x plus c one equals to zero and the second quadratic equation is a two of x square plus b two of x plus c two equals zero these are the two

quadratic equation and whose one root is common means there will be two roots of the first quadratic equation and two roots of another quadratic equation in which one root is common now let us take alpha is the common root alpha is the common root

so it will satisfy both the equations now both the equations will be a one alpha square plus v one alpha plus c one equals to zero we have put the value of x is alpha now let us put the value of x in second equation it will be a two alpha square plus b two alpha plus c two equal zero now we are solving these two equation by using cross multiplication method now it will be alpha square now try to highlight hide alpha square we can take b one b two c one c two the coefficient of alpha is b one b two c one c two now equal alpha now we will hide alpha take the exam take the coefficient c 1 c 2 after that a one a two now the constant part will be one now we will hide c one c two it will be a one a two b one b two now we can expand in this manner we will first multiply left to right it will be alpha square b one c two minus b two c c1 now alpha square b1 c2 minus b2 c1 in a same manner it is alpha over c1 a two minus c two a one now a one b two minus a two b one now alpha square will be b one c two minus b two c one divided by a one b two minus a two b one now we can find out alpha by taking last two c alpha equals c one a two minus c two a one divided by a one b two minus a two b one now we can find out the condition in which the roots are common now we will equalize alpha square equal alpha to the whole square now the value of alpha square is b one c two minus v two c one over a one b two minus a two b one it will be b one c two minus b two c one over a one b two minus a two b one now the value of alpha is c one a two minus c two a one over a one b two minus a two b one c one a two minus c two a one over a one b two minus a two b one to the whole square now it will be b one c two minus b two c one over a one b two minus a two b one c one a two minus c two a one to the whole square over a one b two minus a two v one to the whole square or these two will be cancel out now the value of c one a two now it will be c one a two minus c two a one to the whole square equal b one c two minus b two c one multiplied by a one b two minus a two b one now this is the condition when the two quadratic equation which have one common root

so we can find out the conditional condition of two roots to be equal now let us take some examples of the example number one ah find the value of k if the equation two x square plus k x minus five equals zero and x square minus three x minus four equals have one roots in common now solution will be that alpha be the common roots now it will satisfy both the equation now the equation will be two l first equation will be two alpha square plus k alpha minus five equal zero and the second equation will be alpha square minus three alpha minus four equal zero now we shall find out this by using cross multiplication method it will be alpha square k minus 3 minus 5 minus 4 equal alpha minus 5 minus 4 2 and 1 equal one two one k and minus three now alpha square over minus four k minus fifteen equal alpha minus five plus eight and 1 equals minus 6 minus k now alpha square minus 4 k minus 15 alpha over 3 equal one over minus x minus k the value of alpha square will be four k plus fifteen over k plus six and the value of alpha is minus 3 over k plus 6 now alpha square equal alpha square we will solve the value of k by using this one the alpha case alpha square is four k plus fifteen divided by k plus six and it will be nine of k plus six to the whole square now we can multiply 4 k square plus 24 k plus 15 k plus 90 equal nine now the equation will be four k square plus thirty nine k plus eighty one ah we are try to find out the value of k by using splitting of middle term it will be three twenty four and the factor will be to 162 again 81 twenty seven twenty seven and twelve the factor will be four k square plus twenty seven k plus plus twelve k plus eighty one equal zero now we can take out the common in that the

comma is k four k plus twenty seven and in last two terms 3 will be common 4k plus 27 equal 0.

now the value of k is minus 27 upon 4 and minus 3 now let us take some another example if abc are positive real numbers such that the equation a x square plus b x plus c equals three zero and b x square plus c x plus a equals zero have common roots then the then find the relation among a b and c now in a same way as we have solved earlier question solution let alpha be the common root

so the equation will be a alpha square plus b alpha plus c equals to zero and second equation will be v alpha square plus c alpha plus a equals zero let us try to solve by cross multiplication method it will be alpha square b c c a alpha c a a b and one a b b c alpha square equal a b minus c square and alpha equal c b minus a square and one of ac minus b square alpha square equal a b minus c square over ac minus b square and alpha is cv minus a square over ac minus b square now again alpha square equal alpha through the whole square alpha square is a b minus c square over ac minus b square equal c v minus a square over ac minus b square to the whole square it will be a b minus c square of ac minus b square equal c b minus a square of to the square it will be a square b c minus a b q minus a c cube minus b square plus b square c square equal now let us expand it b square c square plus a to the power 4 minus 2 a square bc this go with this now it will be three a square b c equal a four plus a b q plus a c q on dividing by a both side it will be the condition will be a cube plus b cube plus c cube equal three a b c now we shall discuss in quadratic equation now we shall start cubic equation cubic equation it is in the form of a naught x cube plus a one of x square plus a two of x plus a three equal zero where a naught is not equals to zero and a naught a one a two a three belongs to real numbers

so we shall find out the root of this cubic equation and we shall find out the equation when roots are given

so first of all we will discuss the relation between the roots of cubic equation and their coefficient let us take a cubic equation relation between roots of cubic equation and its coefficient because as we know that it is a cubic equation

so there will be three roots three possible roots

so we shall find out the relation between the roots and the coefficient of cubic equation suppose the cubic equation is a naught x cube plus a one x square plus a two x plus a three equal zero and the roots of this cubic equations are alpha beta and gamma these are the roots of the cubic equation now a naught x cube plus a one of x square plus a two of x plus a three equal a naught x minus alpha x minus beta x minus gamma these two expression will be equal a naught x cube plus a one x square plus a two x plus a three equal a naught x square minus alpha plus beta of x plus alpha beta multiplied by x minus gamma now a naught x cube plus a one x square plus a two x plus a three equal a naught now we shall multiply these two brackets it will be x cube minus gamma of x square now minus alpha plus beta of x square minus plus minus multiplied by minus it will be alpha plus beta of gamma x now alpha beta x minus alpha beta gamma it can be written as a naught x cube minus alpha beta alpha plus beta plus gamma of x square and alpha beta plus beta gamma plus gamma alpha of x minus alpha beta gamma now we can compare a naught x cube plus a one of x square plus a two of x plus a three equal a naught x cube minus a naught alpha plus beta plus gamma of x square plus a naught alpha beta plus beta gamma plus gamma alpha of x minus a naught alpha beta gamma now we will compare the coefficient of lhs and rhs first of all we will compare the coefficient of x square in lhs the coefficient of x square is a one and coefficient of x square in r h s is minus a naught alpha plus beta plus gamma now the value of alpha plus beta plus gamma is minus a one upon a naught we are writing this one is s one sum of roots now compare the

coefficient of x in lhs and rhs the coefficient of axis in lhs is a2 and here the coefficient of x is a naught alpha beta plus beta gamma plus gamma alpha it is a 2 equal that's your coefficient of x a 2 equal a naught alpha beta plus beta gamma plus gamma alpha the value of alpha beta plus beta gamma plus gamma alpha equal a two upon a naught it can be written it can be written as s two now this will be the product sum of product of truths now we can compare the constant part here the constant part is a3 and here the constant part is minus a naught alpha beta gamma now it will be alpha beta gamma equal minus a3 over a naught it can be written as s3 now if alpha beta gamma are the roots of this cubic equation a naught x cube plus a one x square plus a two x plus a three equals zero then we can find out the sum and sum of product of two roots and product of theory roots let us take an example of this one
 so con concept can be understand easily let us discuss an example find the value of alpha plus beta plus gamma and alpha beta plus beta gamma plus gamma alpha and alpha beta gamma if alpha beta and gamma are the roots of the cubic equation x cube plus six x square plus five x minus twelve equal zero now now compare this cubic equation by a naught x cube plus a one x square plus a two x plus a three equal zero the value of a naught is one a one is six a two is five and a three is minus twelve now the value of alpha plus beta plus gamma is minus a one upon a naught the value of a one is six divided by one the value of alpha plus beta plus gamma is minus six now we shall find out alpha beta plus beta gamma plus gamma alpha it is a two upon a naught the value of a two is five and a naught is one
 so it will be five now we shall find out the value of alpha beta gamma which is minus a three over a naught minus the value of a three is minus twelve
 so it will be plus twelve divided by one
 so the product of root is twelve now ah in this class we have discussed about the sum of roots of cubic equation and product of roots of cubic equation now in next class we shall discuss about the nature of roots of cubic equation and we shall find out the roots of the cubic equation thanks you