Programming Assignment 1:

Quadratic Equation Verification with Complex Number Operations

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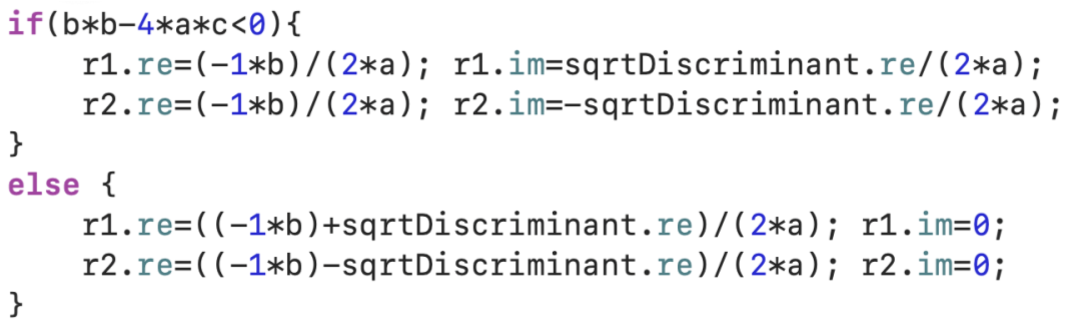
I first define 'complex' using typedef struct, which contains two variables of type float: 're' and 'im'. 're' represents the real part of the complex number, while 'im' represents the imaginary part.

Then, in the subroutine 'complex_D1262032', I use the 'complex' to define four functions: 'add', 'minus', 'product', and 'divide'. This makes it convenient to call and perform addition, subtraction, multiplication, and division on the structure during verification.

Furthermore, I define 'float absComplex', 'complex r2c', and 'void printComplex', where 'r2c' is a function to convert a real number to a complex number.

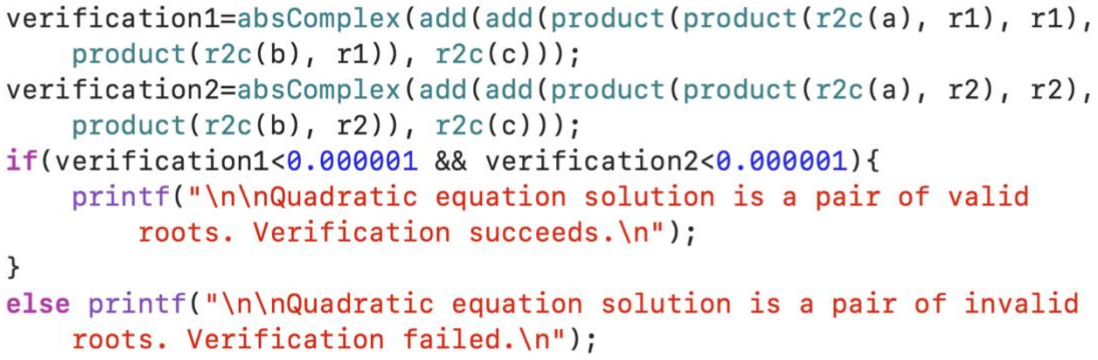
Next, I declare variables a, b, c, verification1 and verification2 using the float data type, and then I declare variables r1, r2 and sqrtDiscriminant using the complex, where r1 and r2 are the two roots of the equation.

Next, I use the following code to find r1 and r2.



```
if(b*b-4*a*c<0){
    r1.re=(-1*b)/(2*a); r1.im=sqrtDiscriminant.re/(2*a);
    r2.re=(-1*b)/(2*a); r2.im=-sqrtDiscriminant.re/(2*a);
}
else {
    r1.re=((-1*b)+sqrtDiscriminant.re)/(2*a); r1.im=0;
    r2.re=((-1*b)-sqrtDiscriminant.re)/(2*a); r2.im=0;
}
```

Then I use printComplex(r1); and printComplex(r2); to print out the two roots. Finally, I use the following code to verify whether the calculated roots are correct.



```
verification1=absComplex(add(add(product(product(r2c(a), r1), r1),
    product(r2c(b), r1)), r2c(c)));
verification2=absComplex(add(add(product(product(r2c(a), r2), r2),
    product(r2c(b), r2)), r2c(c)));
if(verification1<0.000001 && verification2<0.000001){
    printf("\n\nQuadratic equation solution is a pair of valid
        roots. Verification succeeds.\n");
}
else printf("\n\nQuadratic equation solution is a pair of invalid
    roots. Verification failed.\n");
```