Problem 3

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Initializing format,a,b,& c

```
format long e
a = 0.5;
b = 1000;
c = 5e-7;
```

a)

```
%According to Loss of precision theorem,
% 10^-p <= 1- (((b^2 -4ac)^0.5)/b) <= 10^-q

approxLoss = 1- (b/(sqrt(b^2 - 4*a*c)))

disp('we loose 12 to 13 digits ')
```

```
approxLoss =

    -5.000444502911705e-13

we loose 12 to 13 digits
```

b)

roots function returns the true root of the given quadratic equation.

```
r = roots([a b c])
```

```
r =

    -1.999999999999500e+03
    -5.000000000001249e-10
```

c)

finding one of the root using given equations

```
rootFormula = (-b + sqrt(b^2 - 4 * a * c))/(2*a)
relativeError = abs((rootFormula - r(2))/r(2))
% calculating relative error to compare answer with part a.
% the relative error is small.
```

```
rootFormula =

    -4.999947122996673e-10


relativeError =

     1.057540091527060e-05
```

d)

calculating the root using new formula which reduces the catastrophic error

```
newFormulaRoot = (-2*c)/+(b+(sqrt(b^2 - 4* a* c)))
```

```
newFormulaRoot =

    -5.000000000001249e-10
```

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