Scientific Computing Revision Sheet Problems.

1.. Assume that you are solving the quadratic equation

ax2+bx+c=0

with *a* = 1.22,, *b* = 3.88 , and *c* = 3.08, using a normalised floating point system with *β* = 10 and *p* = 3 and *rounding to nearest* .

a.. What is the computed value of the discriminant

1)

2)

3)

4)

b.. What is the correct value of the discriminant in real (exact) arithmetic??

c.. What is the relative error in the computed value of the discriminant??

For a smooth function,, 𝑓: : ℝ ↦ ℝ , consider the finite difference approximation to the second derivative,

1)Using Taylor’s Theorem, determine the bound on the truncation error of this approximation in terms of *h* and a bound on the function derivative *M* of appropriate order (to be determined)

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Bound of truncation error.

2) Assuming the error in function evaluation is bounded by ξ, determine the rounding error in evaluating the finite difference approximation formula.

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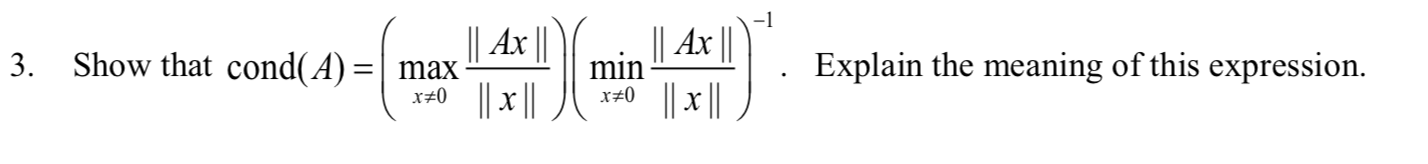
By triangle inequality,

Determine the optimum choice of *h* for which the total error is minimized. What is the value of the minimum error? First, express your answers in terms of *M* and and then obtain numerical values given that M = 1 and = 10.

In order to find *h* we have to find derivative of error equation and compute the derivative for our values of *M* and .

For

For M = 1 and = 10 we have,

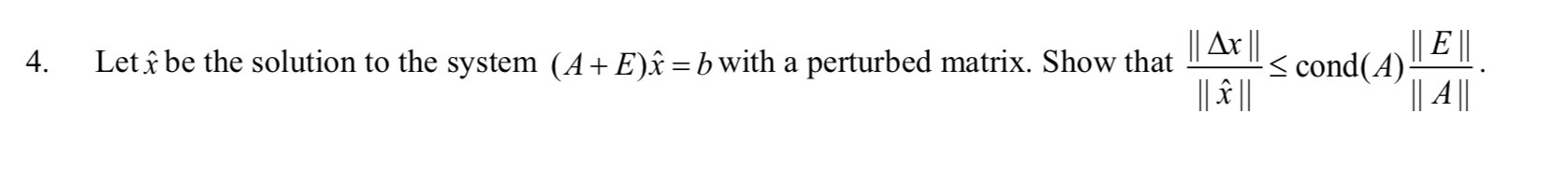


By definition,

Then we need to proof that

So by,

We have,



By definition, we have so then,