Test 2, Interval Computations, Fall 2023

Problem 1. Why do we need guaranteed bounds?

Problem 2. Who invented interval computations?

3–6. Let us use different methods to estimate the range of the function $f(x) = x^2 + x + 1$ when $x \in [-0.6, -0.2]$.

Problem 3. Use straightforward interval computations.

Problem 4. Check for monotonicity.

Problem 5. Apply bisection and try to use monotonicity for each of the two resulting problems.

Problem 6. Use the centered form for those intervals on which we do not have monotonicity.

7–10. Let us use different methods to estimate the range of the function $f(x_1, x_2) = x_1 \cdot x_2 + 0.5 \cdot x_1 + 0.5 \cdot x_2$ when $x_1 \in [-0.6, -0.2]$ and $x_2 \in [-0.8, -0.4]$.

Problem 7. Use straightforward interval computations.

Problem 8. Check for monotonicity with respect to each of the variables.

Problem 9. Apply bisection. Use the algorithm we studied in class to decide which side to bisect. If both sides are equally appropriate, bisect by x_1.

Problem 10. Use monotonicity to estimate the range of each of the two resulting problems; use centered form when there is no monotonicity, and then use the resulting estimates to find the range over all possible pairs (x_1, x_2).