Due date: November 7 @ 11:55pm
Submission Instructions:

- Each person must submit a solution to this assignment on Moodle on the due date.
- Assignments must be typed. I suggest using Latex. If the grader (me!) cannot (easily) read an answer, she will give it a 0.
- All arguments should be clear, concise, and (of course) correct. You will lose points for poor writing, bad grammar, etc...
- Use of the Internet for solving these problems is strictly forbidden, and will be treated as an honor code violation.
- Working together: You may discuss the questions with each other. However:
  - With your submission you must provide a list of all people you discussed the assignment with.
  - No written material may be exchanged during the discussion. If you talk with someone about the assignment, you must throw away and written notes at the end of the discussion.
Problem 1 (20 points): In the arithmancy course at the Hogwarts School for Witchcraft and Wizardry, students are given the following test. There are $n$ boxes in a row, numbered (in order) from 0 to $n-1$. All boxes numbered from 0 to $k$ contain fabulous treasure, while the rest of the boxes just have grindylows\(^1\).

The test is to figure out the value of $k$.

The student is provided with two magic wands – tapping a box with the wand will open it. Unfortunately, the wands come from Weasley’s Wizard Wheezes, where George has rigged them to explode when tapped on the grindylow-filled boxes. A student who blows up both wands without determining the value of $k$ fails the test (and gets a complementary trip to Madam Pomfrey’s).

Given an algorithm for finding that value $k$ that uses at most two wands and requires $o(n)$ wand taps. (Note that that is $o(n)$, not $O(n)$.)

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\(^1\)That is bad.
Problem 2 (20 points): Give an $o(n^3)$ algorithm that takes a set of $n$ points on the plane and returns the largest set of co-linear points. (That is, the largest number of points that can all be connected by a single straight line.)