BONUS 7

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This bonus problem has absolutely nothing to do with our class. The solutions require nothing more than fooling around with the problem for a long enough time (a very long time for some).

**Bonus.** The problem is to connect points while minimizing the number of times the connecting lines cross.

The idea is the following: Given two points, you can connect them with a line. Given three points, you can connect each point to the other two with lines, and likewise for four, five, six and so on.

The problem is to draw a series of pictures.

(a) Take four points on a piece of paper. Connect each point to the other points, crossing as few times a possible (and you don’t have to connect them with straight lines). [Hint: You can do it without crossing at all.]

(b) Take five points on a piece of paper. Connect each point to the other points, crossing as few times as possible. [Hint: You do have to cross at least once.]

(c) Take six points on a piece of paper. Connect each point to the other points, crossing as few times as possible.[Hint: No hint.]

(d) Do the same for seven points on a piece of paper. [You have to cross at least 9 times.]

(e) Do the same for eight points. [You have to cross at least 18 times.]

(f) Do the same for nine points. [You have to cross at least 36 times.]

(g) Do the same for ten points. [You have to cross at least 60 times.]

I should tell you that everyone should be able to do this up to seven points. The problems for eight points and more can be difficult if you don’t take the right approach.

On a side note, it is unknown to mathematicians what the fewest number of crossing is for eleven points. So if you complete this up to ten, then you will have done everyone that can be done.

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If you get really bored, they have conjectured that the fewest number of crossing for eleven is 100. See if you can get it in 99.

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