1. You have been assigned into groups of three for the week. Write down your colleagues’ names and email addresses.

2. As a group, we considered the sequence of points

$$(1, 1) \quad (2, 2) \quad (3, 3) \quad \ldots \quad (n, n) \quad \ldots$$

in $\mathbb{R}^2$, which goes off to infinity. Get a blank sheet of paper and sketch this sequence in the plane.

In homogeneous coordinates, the sequence became

$$(1 : 1 : 1) \quad (2 : 2 : 1) \quad (3 : 3 : 1) \quad \ldots \quad (n : n : 1) \quad \ldots,$$

which is equivalent to

$$(1 : 1 : 1) \quad (1 : 1 : \frac{1}{2}) \quad (1 : 1 : \frac{1}{3}) \quad \ldots \quad (1 : 1 : \frac{1}{n}) \quad \ldots,$$

which converges to

$$(1 : 1 : 0).$$

3. For each of the following sequences, add it to your sketch of the plane, and find its limit in the same way as above.

(a) $$(1, 2), \ (2, 3), \ (3, 4), \ \ldots, \ (n, n + 1), \ \ldots$$
(b) (1, 3), (2, 4), (3, 5), \ldots, (n, n + 2), \ldots

(c) (1, 2), (2, 4), (3, 6), \ldots, (n, 2n), \ldots

(d) Find another sequence that converges to the same limit as (c).

(e) (1, 1), (1, 2), (1, 3), \ldots, (1, n), \ldots

(f) Find another sequence that converges to the same limit as (e).

(g) (1, 1), (2, 4), (3, 9), \ldots, (n, n^2), \ldots
4. The original sequence of points \((x, y)\) in problem 2 satisfies \(y = x\). When we put it into homogeneous coordinates \((x : y : z)\), the same equation still holds, even for the second, rescaled sequence of homogeneous coordinates, and for the limit \((1 : 1 : 0)\).

The original sequence in problem 3(a) satisfies \(y = x + 1\), but when you go into homogeneous coordinates and rescale then this is no longer true, nor is it true in the limit. Can you find an equation involving \(x\), \(y\), and \(z\) that is true at all those points?

Similarly, for each of the remaining parts of problem (3), find an equation in \(x\), \(y\), and \(z\) that works.