Math 1553 Worksheet: Fundamentals and §1.1

- **1.** a) (Warm-up) Draw the set of all points in \mathbb{R}^2 that satisfy the equation x y = 0, where we use (x, y) to denote points in \mathbb{R}^2 .
 - **b)** Draw the set of all points in \mathbb{R}^3 that satisfy the equation x y = 0, where we use (x, y, z) to denote points in \mathbb{R}^3 . Geometrically, does this set form a line, a plane, or something else?

- **2.** Richard Straker has eight light switches in order along a wall. He records which lights are on and which lights are off. To save time, he uses 0 to represent "off" and using 1 to represent "on" for each light.
 - a) Write an element of \mathbb{R}^n (for some n) that represents the situation when all the lights are on. What is n?

b) Repeat part (a) when all lights are off.

3. Find all values of h so that the lines x + hy = -5 and 2x - 8y = 6 do *not* intersect, and indicate what this means for the set of solutions to the linear system of equations

$$x + hy = -5$$
$$2x - 8y = 6.$$

For all h so that the lines do not intersect, draw the line x + hy = -5 and the line 2x - 8y = 6 to verify that they do not intersect.

4. Consider the following three planes, where we use (x, y, z) to denote points in \mathbb{R}^3 :

$$2x + 4y + 4z = 1$$

$$2x + 5y + 2z = -1$$

$$y + 3z = 8$$

Use row reduction to determine if all three of the planes intersect. If so, do they intersect at a single point, a line, or a plane?