Homework 0 does not contain any mathematics — it is just for you to practice using latex. All I want you to do is to try to reproduce this document as well as you can. We don't mind if you work in small groups, but just copying it directly from a friend isn't going to help you later in the term.

Questions:

1. Your solution to question 1.
   How did I break the line?
   It might contain some text in italics or some **in bold** or

   > a short quote.

   But it will almost certainly contain some mathematics, so we need to use the equation environment.

   $$\int \sin(x)dx \ = -\cos(x) + c \tag{1}$$

   Integrals are easy with int, but we can make the dee-x look nicer by forcing latex to write it in roman-font using mathrm

   $$\int \sin(x)\mathrm{d}x \ = -\cos(x) + c \tag{2}$$

   Note that it is a good idea to number all equations, and thankfully latex does this for us when we use the equation environment.

2. Your solution to question 2.
   This might be more involved with some set notation

   $$A \cup (B \cap C) = (A \cup B) \cap (A \cup C) \tag{3}$$

   You should look up the latex commands for these symbols — they are not hard. While you are here, be careful of the length of dashes and hyphens — latex has three different ones for use in different contexts.

   Possibly we'll need some computation that lies across several lines

   $$x^2 + y^2 = 4 \tag{4}$$
   $$y^2 = 4 - x^2 \tag{5}$$
   $$y = \pm\sqrt{4 - x^2} \tag{6}$$

   In this case we use a different environment — the align environment is very good for this and it is defined for us in the amsmath package (which we have already included). You might need to do some reading online to work out how to use & correctly.

3. Your solution to question 3.
   This could involve some actual words as well as mathematical symbols. You will need to write plenty of words in this course.

   $$x^2 + y^2 = 4 \qquad \text{I want to solve this} \tag{7}$$
   $$y^2 = 4 - x^2 \qquad \text{So move the } x \text{ over} \tag{8}$$
   $$y = \pm\sqrt{4 - x^2} \qquad \text{and take a square root} \tag{9}$$

4. And now we are on to question 4.
   It is a good idea to learn to write the symbols for important sets of numbers in black-board bold — thankfully this is defined by mathbb in the amsmath package. We can put a few in a list

   - The natural numbers $\mathbb{N} = \{1, 2, 3, \ldots\}$
   - The integers $\mathbb{Z} = \{0, 1, -1, 2, -2, 3, \ldots\}$
   - The rational numbers $\mathbb{Q} = \{\frac{a}{b} \mid a, b \in \mathbb{Z}\}$.

5. Question 5.
   To make equations look nice, we should be able to change the size of brackets

$$f(\frac{x}{y}) = \text{ugly} \tag{10}$$

$$f\left(\frac{x}{y}\right) = \text{better} \tag{11}$$

$$\{a, b, c, \frac{d}{e}, \int x^3 \mathrm{d}x\} = \text{ugly} \tag{12}$$

$$\left\{a, b, c, \frac{d}{e}, \int x^3 \mathrm{d}x\right\} = \text{a thing of beauty} \tag{13}$$

   There are two ways to do this — using left and right just before the bracket, or using big, Big, bigg, Bigg.

6. Question 6.
   We also need some arrows for logic, in particular

$$P \to Q \qquad \text{is not the same as} \tag{14}$$

$$P \Rightarrow Q \tag{15}$$

   The first means "P tends to Q" while the second means "P implies Q". **You should be careful to get your quotation marks right.** We will also need more arrows when we define functions

$$f : \mathbb{Q} \mapsto \mathbb{R} \tag{16}$$

   That's all. Practice practice practice.