ComSS 331 **Fall 2017** **Name:**_____

HW 0 Due: 28 aug 2017

1. This is an exercise to initiate you to the wonderful world of typesetting using LaTeX. For image-drawing you can use `tgif` (downloadable from the web), or your favorite drawing tool. All you have to do is reproduce the text and figure in the rectangular box below, **exactly** as it appears, including the rectangular border.

   This is an inline equation: $x + y = 3$.
   This is a displayed equation:

   $$x + \frac{y}{z - \sqrt{3}} = 2.$$

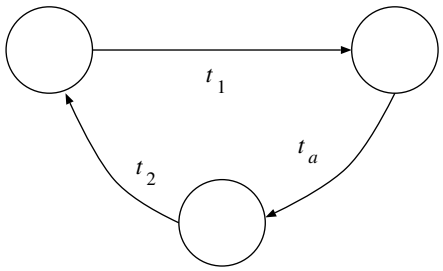
   This is how you can define a piece-wise linear function:

   $$f(x) = \begin{cases} 3x + 2 & \text{if } x < 0 \\ 7x + 2 & \text{if } x \geq 0 \text{ and } x < 10 \\ 5x + 22 & \text{otherwise.} \end{cases}$$

   This is a matrix:

9	9	9	9
6	6	6	
3		3	3

   This is a figure incorporated in a LaTeX file

   The page `http://web.cs.iastate.edu/~ciardo/latex.html` contains a few hints on how to get started with LaTeX

   Points will be subtracted if your font, font size, spacing, or alignment is different from the one shown, but not if the figure is slightly different, since different tools may draw slightly different figures.

   As for all other assignments, you must turn one source LaTeX file, as many eps files for figures as needed (one in this case), and the pdf file obtanined by running `pdflatex` 100

2. Show that $\mathbb{N}$ (natural numbers) and $\mathbb{Z}$ (integer numbers) are equinumerous. 25

3. Let $f : S \to S$ be a total function. Prove that, if S is infinite, f can be one-to-one without being onto, and onto without being one-to-one. 25

4. Show that the relation R defined by

   $$\forall m, n \in \mathbb{N}, \quad (m, n) \in R \;\Leftrightarrow\; (m - n) \bmod 3 = 0$$

   is an equivalence relation, and describe its equivalence classes. 25

5. Show that $\sum_{i=1}^{n} i^2 = (2n + 1)(n + 1)n/6$. 25