July 25th, 2019 **Writing Of Mathematics** **Homework 1**
http://www.isibang.ac.in/∼athreya/Teaching/wom19

Due Date: August 1st, 2019
Problems Due: 1, 3

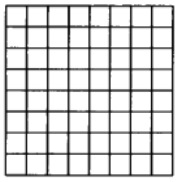
1. Suppose
$$y = f(x) = \begin{cases} x & \text{if} \quad 0 \le x \le 1 \\ 2 - x & \text{if} \quad 1 \le x \le 3 \\ x - 4 & \text{if} \quad 3 \le x \le 4. \end{cases}$$
   (a) Find the domain and range of the function f.
   (b) Draw a graph of the function f.
   (c) Graph the function: $z = 4f(6 - 3x) + 17$.
   (d) Find the domain of the function: $w = \frac{1}{\sqrt{1+2f(2x-1)}}$
   (e) Express the below in terms of $f(t)$, where f is defined as above with x replaced by t. (Your answer should be of the form $y = Af(B(t - C)) + D$):

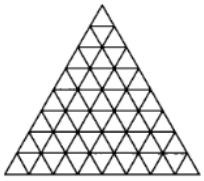
   "*Let y be your speed in m/sec on Mysore Road. Between time t = 0 and t = 10 sec you speed up from 30 m/sec to 35 m/sec, accelerating at a constant rate. At that instant you see a police car ahead, and you start decelerating at a constant rate, slowing to 25 m/sec at time t = 30. Noticing that the police car is taking a right into Gopalan Arcade on Mysore Road, you start accelerating again, reaching your original speed of 30 m/sec at time t = 40.* "

2. On July 24th, 2018, the *Indian Slow coach* reported that the Indian Statistical Institute was awarding 25% more B.Math (Hons.) degrees than the economy could absorb. The headline concluded that there was 1 in 4 chance of underemployment[1]. What should the correct statement of the odds have been ?

3. Given several piles of 1 Rupee coins from the ISI-Canteen cashier, we create a new collection by removing one coin from each old pile to make a new pile. Each original pile shrinks by one. That is, for example: if the original collection had four piles of 1,1,2,5 then the new set of piles will have 1,4,4. Which lists of sizes (order is not important) are unchanged under this operation ?

4. *Extra Credit*[2] *An ordinary chess-board has* 204 *squares in total. How many squares of all sizes are there in an* $n \times n$ *"chess-board " ? How many triangles of all sizes arise using a triangular grid with sizes of length* n *?*





[1] means having no job or having a job not requiring the B.Math (hons.) degree
[2] This problem is intended as a writing skill challenge. If you submit a well-written solution then it shall be posted on the course website.