1. Let S and T be subset of real numbers $\mathbb{R}$. Suppose $f : S \to T$

$$y = f(x) = \begin{cases} x & \text{if} & 0 \leq x \leq 1 \\ 2 - x & \text{if} & 1 \leq x \leq 3 \\ x - 4 & \text{if} & 3 \leq x \leq 4. \end{cases}$$

   (a) Find the domain S, range T of the function f and Draw its graph.

   (b) Graph each of the following on the respective domains:-

      (i) $3 + f(x - 2)$, (ii) $1 - f(x + 2)$, (iii) $f(4x)$, (iv) $f(\frac{x}{4})$, (v) $f(-x)$, (vi) $f(1 - 2x)$.

   (c) Find the domain D of the following:

      (i) $\sqrt{f(x)}$, (ii) $\frac{1}{f(x)}$, (iii) $\sqrt{2f(x + 3)}$,

2. Express each of the following functions in terms of $f(t)$, where f is defined as above with x replaced by t. (Your answer should be of the form $y = Af(B(t - C)) + D$)

   (a) Soha is in second year of B.Math(hons.) and she tries without success to find an open canteen for a midnight snack. Leaving the campus at time t $= 0$, she walks East at the constant speed of 3 km per hour for an hour, then return past the campus, walks the same distance to the West, and finally returns to ISI campus, hungry and despondent (always walking at the same speed). Let y be Soha's distance from ISI campus at time t (with East taken as the positive direction).

   (b) Madurai never seemed to sleep, so its stock exchange decided to be open for 24 hours trading. The stock market's MSE index on Monday (time t $= 0$) is at 3400. On Tuesday it goes up 30 points, then on Wednesday and Thursday it drops 30 points each day, and finally it closes out the week at 3400.

   (c) On the 1st through 5th day of Semester I, the number of people attending Siva's class was at

$$47, 39, 47, 35, \text{ and } 47,$$

   respectively.

3. Let $f : \mathbb{R} \to \mathbb{R}$ be given by $f(x) = x^2 + 5x + 6$. Find the domain of the function

$$z = \frac{1}{f(x) - 2} + \sqrt{f(x)}$$