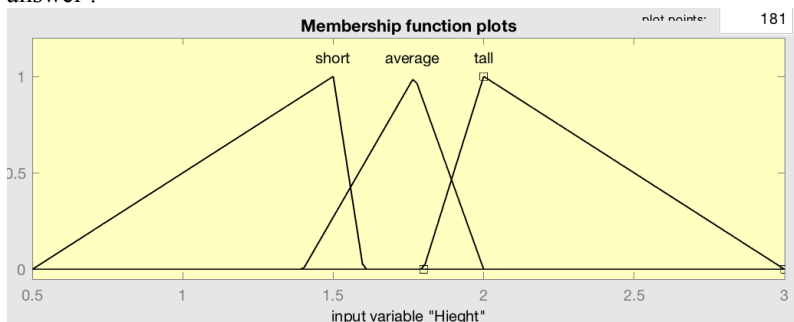1. Design membership functions to describe the linguistic terms "tall", "average", and "short". Justify your answer :

The average height of a male is 5'9" , using that as the average point I then assessed the tallest and shortest heights in history, 8'11" and ~1'. With these ranges I can assess that most people can be considered short a few deviations away from average and tall a few deviations away from average.

2. Let $A = \frac{0.3}{1} + \frac{1}{2} + \frac{0.2}{3}$ and $B = \frac{0.5}{1} + \frac{0.6}{2} + \frac{0.2}{3}$. Find the following:

(a) $A \cup B = \max[\mu_A(x), \mu_B(x)] = 0.5/1 + \frac{1}{2} + 0.2/3$

(b) $A \cap B = \min[\mu_A(x), \mu_B(x)] = 0.3/1 + 0.6/2 + 0.2/3$

(c) $\overline{A \cap B} = 1 - (\min[\mu_A(x), \mu_B(x)]) = 0.7/1 + 0.4/2 + 0.8/3$

3. For fuzzy sets A, B, and C defined on the universe
   X={0, 1, 2, 3, 4, 5, 6, 7,8}

   A={0.1/2, 0.7/3, 1/4, 0.3/5, 0.2/6}
   B={0.2/1, 0.3/2, 0.6/3, 1/4, 0.7/5, 0.4/6, 0.1/7}
   C={.4/2, .8/4, 1/5, .6/7, .4/8}

Answer the followings:
   (a) A∩B∩C =
       a. $\min[\mu_A(x), \mu_B(x)]$ = {0/1, 0.1/2 ,0.6/3 , ¼ ,0.3/5 , 0.2/6 , 0.1/7}
       b. $\min[\mu_{AB}(x), \mu_C(x)]$ ={0/1, 0.4/2 ,0.6/3 , 0.8/4 ,0.3/5 , 0.2/6 , 0.1/7 , 0.4/8}
       c. A∩B∩C ={0.2/1, 0.4/2 ,0.6/3 , 0.8/4 ,0.3/5 , 0.2/6 , 0.1/7 , 0.4/8}

   (b) A∪B∪C =
       a. $\max[\mu_A(x), \mu_B(x)]$ = {0/0,0.2/1,0.3/2,0.7/3,1/4,0.7/5,0.4/6,0/7,0/8}
       b. $\max[\mu_{AB}(x), \mu_C(x)]$ ={0/0,0.2/1,0.6/2,0.7/3,1/4,1/5,0.4/6 , 0.6/7 , 0.4/8}
       c. A∪B∪C ={0/0,0.2/1,0.6/2,0.7/3,1/4,1/5,0.4/6 , 0.6/7 , 0.4/8}

   (c) A∪B∩C

      a.   A∪B = {0/0,0.2/1,0.3/2,0.7/3,1/4,0.7/5,0.4/6,0/7,0/8}

      b.   A∪B∩C = min[μ$_{A+B}$(x), μ$_C$(x)] = {0/0,0.2/1,0.3/2,0.7/3,0.8/4,0.7/5,0.4/6,0/7,0/8}

(d) Determine the intersection and union of the complements of fuzzy set B and C.

      a.   ~B={1/0, 0.8/1, 0.7/2, 0.4/3, 0/4, 0.3/5, 0.6/6, 0.9/7,0/8}

      b.   ~C={1/0,1/1,0.6/2,1/3, 0.2/4, 1/5, 0/6, 0.4/7, 0.6/8}

      c.   ~B∪~C = {1/0,1/1,0.7/2,1/3,0.2/4,1/5,0.6/6,0.9/7,0.6/8}

      d.   ~B∩~C = {1/0,0.8/1,0.6/2,0.4/3,0/4,0.3/5,0/6,0.4/7,0/8}

4. Consider two fuzzy sets $A_1 = \dfrac{0.1}{x_1} + \dfrac{0.3}{x_2} + \dfrac{0.2}{x_3} + \dfrac{0.5}{x_4}$ and $A_2 = \dfrac{0.5}{y_1} + \dfrac{1}{y_2} + \dfrac{0.3}{y_3}$.

      Determine the fuzzy relation among these two sets. Draw the graph

	Y1	Y2	Y3
X1	0.5/0.1	1/0.1	0.3/0.1
X2	0.5/0.3	1/0.3	0.3/0.3
X3	0.5/0.2	1/0.2	0.3/0.2
X4	0.5/0.5	1/0.5	0.3/0.5