1. (a) Show that Yager’s class of fuzzy complements satisfies the involution property.
   
   (b) Show that Algebraic Product and Algebraic Sum as T-norm and T-conorm operators support the generalization of DeMorgan’s Law. You need to show only $S(a,b) = N(T(N(a), N(b)))$ and assume $N(a) = 1 - a$.

   (c) Show whether it holds or does not hold if we consider Yager’s class of complements, using the same definitions of T-norm and S-norm. You have to give detailed steps to prove your point.  

2. If a fuzzy set A has membership function: Trapezoid(x; 2, 5, 10, 20) and another fuzzy set B has membership function: Trapezoid(x; 4, 6, 8, 25), plot $A \cup B$ for values of x between 0 and 30 using drastic sum as the S-norm operator.

3. Define a Contrast Diminisher operator (DIM) such that $DIM(INT(A)) = A$.

4. Let the binary fuzzy relations $R_1 = “x \text{ is relevant to } y”$ and $R_2 = “y \text{ is relevant to } z”$ on finite universes $X = \{1, 2, 3\}$, $Y = \{\alpha, \beta, \gamma, \delta\}$ and $Z = \{a, b\}$ be defined as follows:

\[
R_1 = \begin{bmatrix}
0.1 & 0.3 & 0.6 & 0.7 \\
0.4 & 0.3 & 0.4 & 0.9 \\
0.6 & 0.2 & 0.1 & 0.2 \\
\end{bmatrix}, \quad R_2 = \begin{bmatrix}
0.5 & 0.1 \\
0.3 & 0.1 \\
0.5 & 0.1 \\
0.5 & 0.1 \\
\end{bmatrix}
\]

Derive the value of the fuzzy relation “x is relevant to z” for $x=1$ and $z=b$ using max-product composition.