x = 0:0.1:10;

A = max(min((x - 1) / 2, (5 - x) / 2), 0);

B = max(min((x - 4) / 2, (8 - x) / 2), 0);

complement\_A = 1 - A;

complement\_B = 1 - B;

% Intersection and Union of A and B

intersection\_AB = min(A, B);

union\_AB = max(A, B);

% De Morgan's Laws

lhs1 = 1 - intersection\_AB; % De Morgan's Law 1: ¬(A ∩ B)

rhs1 = max(complement\_A, complement\_B);

lhs2 = 1 - union\_AB; % De Morgan's Law 2: ¬(A ∪ B)

rhs2 = min(complement\_A, complement\_B);

% Plotting the fuzzy sets and operations

figure;

% Plot fuzzy set A

subplot(3, 2, 1);

plot(x, A, 'b-', 'LineWidth', 2);

title('Fuzzy Set A');

xlabel('x');

ylabel('Membership Degree');

grid on;

% Plot fuzzy set B

subplot(3, 2, 2);

plot(x, B, 'r-', 'LineWidth', 2);

title('Fuzzy Set B');

xlabel('x');

ylabel('Membership Degree');

grid on;

% Plot Complement of A and B

subplot(3, 2, 3);

plot(x, complement\_A, 'b--', x, complement\_B, 'r--', 'LineWidth', 2);

title('Complement of A and B');

xlabel('x');

ylabel('Membership Degree');

legend('¬A', '¬B');

grid on;

% Plot LHS and RHS of De Morgan's Law 1

subplot(3, 2, 4);

plot(x, lhs1, 'g-', x, rhs1, 'm--', 'LineWidth', 2);

title('De Morgan Law 1: ¬(A ∩ B) = ¬A ∪ ¬B');

xlabel('x');

ylabel('Membership Degree');

legend('¬(A ∩ B)', '¬A ∪ ¬B');

grid on;

% Plot LHS and RHS of De Morgan's Law 2

subplot(3, 2, 5);

plot(x, lhs2, 'g-', x, rhs2, 'm--', 'LineWidth', 2);

title('De Morgan Law 2: ¬(A ∪ B) = ¬A ∩ ¬B');

xlabel('x');

ylabel('Membership Degree');

legend('¬(A ∪ B)', '¬A ∩ ¬B');

grid on;