

All the exercises below require demonstrations which you need to do step by step. Please refer to the given list of Boolean Algebra identities for this!  
 For questions that require proof algebraically please start from one of the sides and reach the other side.

1.

Which of the following Boolean equation is/are incorrect? Write the correct forms of the incorrect ones :

- |                       |                               |                     |
|-----------------------|-------------------------------|---------------------|
| (a) $A + A' = 1$      | (b) $A + 0 = A$               | (c) $A \cdot 1 = A$ |
| (d) $AA' = 1$         | (e) $A + AB = A$              | (f) $A(A+B)' = A$   |
| (g) $(A+B)' = A' + B$ | (h) $(AB)' = A'B'$            | (i) $A + 1 = 1$     |
| (k) $A + A'B = A + B$ | (l) $X + YZ = (X + Y)(X + Z)$ | (j) $A + A = A$     |

2.

Find the complement of the following functions applying De'Morgan's theorem

- (a)  $F(x,y,z) = x'yz' + x'y'z$       (b)  $F(x,y,z) = x(y'z + yz)$

3.

Find the complements of the expressions :

- (i)  $X + YZ + XZ$       (ii)  $AB(C'D + B'C)$

4.

Prove algebraically that  $(X + Y)(X + Z) = X + YZ$ .

5.

Prove algebraically that  $X + X'Y = X + Y$ .

6.

What would be the complement of the following: (a)  $A'(BC' + B'C)$       (b)  $xy + y'z + z'z$  ?

7.

Prove (giving reasons) that  $[(x + y)' + (x + y)']' = x + y$

8.

Simplify the following Boolean expression :

- (i)  $AB + AB' + A'C + A'C'$       (ii)  $XY + XYZ' + XYZ' + XZY$       (iii)  $XY(X'YZ' + XY'Z' + XY'Z')$

9.

Given  $F = A'B + (C' + E)(D + F')$ , use de Morgan's theorem to find  $F'$ .

- (a)  $ACE' + BCE' + D'F$       (b)  $(A + B')(CE' + D'F)$       (c)  $A + B + CE'D'F$   
 (d)  $ACE' + AD'F + B'CE' + B'CE' + B'D'F$       (e) NA

10.

**Prove  $(A + B).(A' + C) = (A + B + C).(A + B + C').(A' + B + C).(A' + B' + C)$  algebraically.**

11.

**Verify  $X.Y' + Y'.Z = X.Y'.Z + X.Y'.Z' + X'.Y'.Z$  algebraically.**

12.

**Prove algebraically  $x'y'z' + x'y'z + x'yz + x'yz' + xy'z' + xy'z = x' + y'$**