1- In each case, multiply out to obtain a sum of products: (Simplify where possible)
(a) \(A'bc'd+(a'+bc)(a+c'd')+bc'd+a'bc'\)
(b) \((A+B+C')(A'+B'+D)(C+A'+D')(C'+A+D)\)

2- (a) Reduce to a minimum sum of products (4 terms): (Hint: consensus term, add eliminate)
\(DB+DCA+(BC\oplus A)\)
(b) Reduce to a minimum sum of products (3 terms): (consensus theorem)
\(A'\oplus B \oplus C\)
(c) Reduce to a minimum product of sums (4 terms): (consensus theorem)
\(AC+A'BD'+A'BE+A'C'\)

3- Eliminate the exclusive-OR, and then factor to obtain a minimum product of sums:
(a) \(D'B'+(D\oplus CA)\)
(b) \(CB+(A\oplus B)C+A'B\)

4- Simplify each of the following expressions:
(a) \(AD'(B+C)+(B+C)AD+(B+C)(B'+C)\)
(b) \(A'B'+AC'B'D'+BC+DC\)
(c) \(CB+BA+B'A\)

5- Reduce to a minimum sum of products:
\((A\oplus BC)+BDA+(D\equiv B'A')\)

6- Determine which of the following equations are always valid (give an algebraic proof):
(a) \(xy'+xz+yz=x'y+zx'+zy\)
(b) \(AB+CA'+BC=CB'+AC'+AB\)
(c) \(ABC+ACB+BCD+B'C=AD+BCD+ABC+ABC'+B'CD\)

7- Simplify each of the following expressions:
(c) \(Ab'cd'e+acd+ac'd'g'+abcd'e+acde'+e'h'\)
(d) \(1+1'[J'(K)+K']\)
(e) \(DA'C'+[B'C+A'+D')(C'A+B+D)]'+C'D'B'\)
(f) \(EFB'A'+B'FE+A'BDC+A'DC'B+EFA'D+E'CDG\)

8- Prove algebraically:
(a) \((w'+x+y')(w+x'+y)(w+y'+z)=w'x'y'+w'y+z+wx+wy'\)
(b) \((x'+y')(x\oplus z)+(x+y)(x\oplus z)=x'z'+x'y'+y(z\oplus x)\)
(c) \(B'D'A+D'C'B'+CDB+CBA=(D+A+B')(C+B')(D'+B)(A+B+C')\)