HW 8.1 - assigned

By substitution the Boolean expression equivalent of the binary operation as defined in **Table of 16 functions on 2 variables**, show the following:

(a) The inhibition operation is neither commutative nor associative.

(b) The exclusive-OR operation is commutative and associative.

a) Inhibition: $f_2 = xy'$ $f_4 = x'y$

if $f_2 = xy' = \frac{x}{y}$ is commutative then $\frac{x}{y} = \frac{y}{x}$

Counter example : $\frac{x}{y} \neq \frac{y}{x}$ if $x = 1$ & $y = 0$

$\frac{x}{y} \neq \frac{y}{x} \longleftrightarrow xy' \neq yx' = 1.1 \neq 0.0 = 1 \neq 0$ ✓

Thus, f_2 is not commutative

b) Exclusive-OR: $f_6(x,y) = xy' + x'y = x \oplus y$

if f_6 is associative, $(x \oplus y) \oplus z = x \oplus (y \oplus z)$

$LS = (xy' + x'y) \oplus z = (xy' + x'y)z' + (xy' + x'y)'z = xy'z' +$
$x'yz' + (x' + y)(x + y')z =$
$xy'z' + x'yz' + x'y'z + xyz$

$RS = x \oplus (yz' + y'z) = x(yz' + y'z)' + x'(yz' + y'z) =$
$x(y' + z)(y + z') + x'yz' + x' + x'y'z =$
$xy'z' + x'yz' + x'y'z + xyz$

Thus f_6 is associative because $LS = RS$