Hw 2 8) Prove algebraically

A) $(w'+x+y')(w+x'+y)(w+y'+z) = w'x'y' + w'yz + wx + wy'$

$= w'x'y' + w'yz + wx + wy'$ Distributive

$= w'(x'y' + yz) + w(x + y')$

$= (w + x'y' + yz)(w' + x + y')$

$= (w + (x'+y)(y'+z))(w' + x + y')$

$= (w + (x'+y))(w + (y'+z))(w' + x + y')$

so $(w'+x+y')(w+x'+y)(w+y'+z)$

$= w'x'y' + w'yz + wx + wy'$

B) $(x'+y')(x \oplus z) + (x+y)(x \oplus z) = xz' + x'zy' + y(z \oplus x)$

$(x'+y')(x \oplus z) + (x+y)(x \oplus z)$

$= (x' + y' + x + y)(x \oplus z)$

$= (x \oplus z)$

$xz' + x'zy' + y(z \oplus x)$

$= xz' + x'zy' + y(z'x + x'z)$

$= xz' + x'zy' + yz'x + yx'z$

$= xz'(1 + y) + x'z(y + y')$

$= xz' + x'z$

$= (z \oplus x)$

therefore

$(x'+y')(x \oplus z) + (x+y)(x \oplus z) = xz' + x'zy' + y(z \oplus x)$

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c)

$$A'D'B + D'C'A' + CDA + CAB = (D+B+A')(C+A')(D'+A)(A+B+C')$$

$$(D+B+A')(C+A')(D'+A)(A+B+C')$$

$$= (CD + CB + \cancel{CA'} + \cancel{AD'} + \cancel{A'B} + A')(\cancel{D'A} + D'B + D'C' + A + \cancel{AB + AC'})$$

$$(CD + CB + A')(D'B + D'C' + A)$$

$$= A'(D'B + D'C') + A(CD + CB)$$

$$= A'D'B + A'D'C' + ACD + ACB$$

therefore

$$A'D'B + A'D'C' + ACD + ACB = (D+B+A')(C+A')(D'+A)(A+B+C')$$