Group Homework 6

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1. $f(X,Y,Z) = Y + X'Y'Z'$

$$
\begin{aligned}
&= Y + (X + Y + Z)' \\
&= ((Y')(X + Y + Z))' \\
&= (Y'X + Y'Y + Y'Z)' \\
&= (Y'X + Y'Z)' \\
&= (Y'X)'(Y'Z)' \\
&= (Y + X')(Y + Z') \\
&= YY + YZ' + X'Y + X'Z' \\
&= Y(1 + Z' + X') + X'Z' \\
&= Y + X'Z'
\end{aligned}
$$

2. $f(X,Y,Z) = (X+Y)(X+Z)(Z+Y)$

$= (XX + XZ + XY + YZ)(Z+Y)$

$= XZ + XY + XZY + YZ$

$= XZ + XY(1+Z) + YZ$

$= XZ + XY + YZ$

3. $f(X,Y,Z) = X'Y' + X'Y + YZ' + XZ'$

$= X'(Y'+Y) + YZ' + XZ'$

$= X' + YZ' + XZ'$

$= ((X)(XZ')'(YZ')')'$

$= ((X)(X'+Z)(Y'+Z))'$

$= ((X)(X'Y' + X'Z + Y'Z + ZZ))'$

$= (XX'Y' + XX'Z + XY'Z + XZ)'$

$= (XZ(Y'+1))'$

$= (XZ)'$

$= X' + Z'$

4. $f(W, X, Y, Z) = YW + X'YZ' + XZ'W + XYZ + X'ZW$

$=$

$=$

$=$

$=$

$=$

5. $f(X,Y,Z) = (X+Z)(X+Y')(Y+Z)$

$$
\begin{aligned}
&= (X + XY' + ZX + ZY')(Y+Z) \\
&= XY + XZ + XY'Y + XY'Z + ZXY + ZXZ + ZY'Y + ZY'Z \\
&= XY + XZ + XY'Z + XYZ + ZY' \\
&= XY + XZ + XZ(Y' + Y) + ZY' \\
&= XY + XZ + ZY'
\end{aligned}
$$

6. $f(W,X,Y,Z) = (W' + X')'(Y+Z)'$

$$
\begin{aligned}
&= WX(Y+Z)' \\
&= WX(Y'Z') \\
&= WXY'Z'
\end{aligned}
$$

7. $f(X,Y,Z) = (X+Y)(X'+Y)(X+Y')(X'+Y')$

$= (XX'+XY+X'Y+YY)(XX'+XY'+X'Y'+Y'Y')$

$= (XY+X'Y+Y)(XY'+X'Y'+Y')$

$= Y(X+X'+1)Y'(X+X'+1)$

$= YY'$

$= 0$

8. $f(A, B, C, D) = AB + A'C + B'CD$

$=$

$=$

$=$

$=$

$=$

9. $f(A, B, C, D) = AB + A'C + B'D + CD$

$=$

$=$

$=$

$=$

$=$

10. $f(X,Y,Z) = (X'(XY'Z')')Z$

$$
\begin{aligned}
&= Z(X'(X' + Y + Z))' \\
&= Z(X'X' + X'Y + X'Z)' \\
&= Z(X'(1 + Y + Z))' \\
&= Z(X')' \\
&= ZX
\end{aligned}
$$