

$$10. (a) (X' + Y) (W + Z) (X + Y' + Z)$$

$$= (X' + Y + WW' + ZZ') (XX' + YY' + W + Z) (X + Y' + Z + WW')$$

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

$$\cdot (X + Y + W + Z) (X + Y' + W + Z) (\cancel{X' + Y + W + Z}) (\cancel{X' + Y' + W + Z})$$

$$\cdot (\cancel{X + Y' + Z + W}) (\cancel{X + Y' + Z + W'})$$

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

$$\cdot (X + Y + W + Z) (X + Y' + W + Z) (X' + Y' + W + Z) (X + Y' + Z + W')$$

$$(b) (X + Y) WZ + (X + Y)'$$

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

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

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

$$= (X' + W + YY' + ZZ') (X' + Z + YY' + WW') (Y' + W + XX' + ZZ') (Y' + Z + XX' + WW')$$

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

$$\cdot (\cancel{X' + Z + Y + W}) (\cancel{X' + Z + Y + W'}) (\cancel{X' + Z + Y' + W}) (\cancel{X' + Z + Y' + W'})$$

$$\cdot (\cancel{Y' + W + X + Z}) (\cancel{Y' + W + X + Z'}) (\cancel{Y' + W + X' + Z}) (\cancel{Y' + W + X' + Z'})$$

$$\cdot (\cancel{Y' + Z + X + W}) (\cancel{Y' + Z + X + W'}) (\cancel{Y' + Z + X' + W}) (\cancel{Y' + Z + X' + W'})$$

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

$$\cdot (X' + Z + Y + W') (X' + Z + Y' + W') (Y' + W + X + Z) (Y' + W + X + Z')$$

$$\cdot (Y' + Z + X + W')$$