Q3

a) $\bar{X}\bar{Y} + XYZ + \bar{X}Y$

$= \bar{X}(\bar{Y}+Y) + XYZ$ distributivity

$= \bar{X} + XYZ$ complement

$= \bar{X} + YZ$ simplification

b) $X + Y(Z + (\overline{\bar{X}+Z}))$

$= X + Y(Z + \bar{X}\bar{Z})$ de Morgan

$= X + Y(Z + \bar{X})$ simplification

$= X + YZ + \bar{X}Y$ distribute

$= X + YZ + Y$ simplification

$= X + Y$ absorbtion

c) $\bar{W}X(\bar{Z} + \bar{Y}Z) + X(W + \bar{W}YZ)$

$= \bar{W}X(\bar{Z} + \bar{Y}) + X(W + YZ)$ simplification

$= \bar{W}X\bar{Y} + \bar{W}X\bar{Z} + WX + XYZ$ distribute

$= X(\bar{W}\bar{Y} + \bar{W}\bar{Z} + W + YZ)$ distributive

$= X(\bar{Y} + \bar{Z} + W + YZ)$ simplification

$= X(\bar{Y} + \bar{Z} + W + Z)$ simplification

$= X(\bar{Y} + W + 1)$ compliment

$= X + X\bar{Y} + XW$ distribute

$= X$ absorbtion