# Homework 1

## Mitchel Fields

## February 3, 2016

2.2 (b) $(x + y)(x + \overline{y}) = x(y + \overline{y}) = x(1) = x$

   (c) $xyz + \overline{x}y + xy\overline{z} = y(xz + \overline{x} + x\overline{z}) = y(\overline{x} + x(z + \overline{z})) = y(\overline{x} + x(1)) = y(1) = y$

   (d) $(A + B)(\overline{A} + \overline{B}) = (A + B)\overline{(AB)} = A\overline{B} + \overline{A}B = A \oplus B$

   (e) $(a + b + \overline{c})(\overline{a}.\overline{b} + c) = (a + b + \overline{c})(\overline{a + b} + c) = (a + b) \oplus c$

   (f) $\overline{a}bc + ab\overline{c} + abc + \overline{a}b\overline{c} = b(\overline{a}c + a\overline{c} + ac + \overline{a}\overline{c}) = b(1) = b$

2.10 (a) The Boolean function $E = F_1 + F_2$ is true when either $F_1$ or $F_2$ or both are true. Thus it contains the union of their minterm sets.

   (b) The Boolean function $G = F_1F_2$ is true only when both $F_1$ and $F_2$ are true. Thus it contains the intersection of their minterm sets.

2.11 (a) $F = xy + x\overline{y} + \overline{y}z$

| $x$ | $y$ | $z$ | $xy$ | $x\overline{y}$ | $\overline{y}z$ | $xy + x\overline{y} + \overline{y}z$ |
|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 | 0 | 1 | 1 |
| 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 0 | 1 | 0 | 1 |
| 1 | 0 | 1 | 0 | 1 | 1 | 1 |
| 1 | 1 | 0 | 1 | 0 | 0 | 1 |
| 1 | 1 | 1 | 1 | 0 | 0 | 1 |

   (b) $F = bc + \overline{a}.\overline{c}$

| $a$ | $b$ | $c$ | $bc$ | $\overline{a}.\overline{c}$ | $bc + \overline{a}.\overline{c}$ |
|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 1 | 1 |
| 0 | 0 | 1 | 0 | 0 | 0 |
| 0 | 1 | 0 | 0 | 1 | 1 |
| 0 | 1 | 1 | 1 | 0 | 1 |
| 1 | 0 | 0 | 0 | 0 | 0 |
| 1 | 0 | 1 | 0 | 0 | 0 |
| 1 | 1 | 0 | 0 | 0 | 0 |
| 1 | 1 | 1 | 1 | 0 | 1 |

2.14 (a) With AND, OR, and inverter gates

(b) With OR and inverter gates

(c) With AND and inverter gates