12.9

a) $2^4 - 1111 = 10000 - 1111 = 1$

b) $2^7 - 1001101 = 110011$

c) $2^7 - 1011100 = 100100$

d) $2^5 - 11101 = 100000 - 11101 = 11$

12.15

Applying the rules of Boolean algebra,

$$F = \bar{A}\,B(C + \bar{C}) + AB(C + \bar{C}) = \bar{A}\,B + AB$$

Therefore, $F = B(\bar{A} + A) = B$

12.11

$A\,B\,C$	BC	$B\bar{C}$	$\bar{B}A$		$A+B$
0 0 0	0	0	0	0	0
0 0 1	0	0	0	0	0
0 1 0	0	1	0	1	1
0 1 1	1	0	0	1	1
1 0 0	0	0	1	1	1
1 0 1	0	0	1	1	1
1 1 0	0	1	0	1	1
1 1 1	1	0	0	1	1

Comparing the last two columns, it is clear that $BC + B\bar{C} + \bar{B}A = A + B$

12.17

$$F = \overline{AB} \bullet \overline{CD} \bullet \overline{E}$$

$$= \overline{AB + CD + E}$$

where the second expression is a result of applying DeMorgan's theorem to the first.

12.20