2.

```
`timescale 1ns / 1ps

    module half_adder(output S, C, input x,y);

       xor(S,x,y);
       and(C,x,y);
    endmodule

    module full_adder(output S,C,input x,y,z);
       wire S1, C1, C2;
       half_adder HA1(S1,C1,x,y);
       half_adder HA2(S,C2,S1,z);
       or G1(C,C2,C1);
    endmodule
```

Steven Tang

Homework 3

3. (C) $x \circledR x = 0$.

got answer from book

4. $AB + CD + A\bar{C} + D\bar{E}$

$= (A+B)(C+D)(A+\bar{C})(D+\bar{E})$

(B) Did the duality

5. $\overline{AB(\bar{C}+D)E+F}$

$= \overline{A+B+(\bar{C}D)+EF}$

$\boxed{\text{none of the above}}$

6. D) $x \circledR y = \overline{xy + \bar{x}y}$

got answer from the book, every thing was there except this.

7.

x	y	z	$x \circledR y$	$(x \circledR y) \circledR z$	
0	0	0	0	0	
0	0	1	0	1	− 1
0	1	0	1	1	− 2
0	1	1	1	0	
1	0	0	1	1	− 4
1	0	1	1	0	
1	1	0	0	0	
1	1	1	0	1	− 7

$\boxed{A}$ $\boxed{\Sigma\ 1, 2, 4, 7}$

8.

A	B	C	D	$A \oplus B$	$C \oplus D$	$(A \oplus B) \oplus (C \oplus D)$
0	0	0	0	0	0	0
0	0	0	1	0	1	1 - 1
0	0	1	0	0	1	1 - 2
0	0	1	1	0	0	0
0	1	0	0	1	0	1 - 4
0	1	0	1	1	1	0
0	1	1	0	1	1	0
0	1	1	1	1	0	1 - 7
1	0	0	0	1	0	1 - 8
1	0	0	1	1	1	0
1	0	1	0	1	1	0
1	0	1	1	1	0	1 - 11
1	1	0	0	0	0	0
1	1	0	1	0	1	1 - 13
1	1	1	0	0	1	1 - 14
1	1	1	1	0	0	0

$= \boxed{\oplus \quad \Sigma\, 1, 2, 4, 7, 8, 11, 13, 14}$

9. 1010 - 10
1011 - 11
1100 - 12
1101 - 13
1110 - 14
1111 - 15

} unused combos for BCD

$= 10 + 11 + 12 + 13 + 14 + 15$

$\boxed{\Sigma\ [illegible] = 75}$

Stevens
Tang

Hw 8 cont

10. $\boxed{\text{Ans: A, B, C}}$

A = 0110
B = 1010
C = 1
The reason why we need A/B is because we inputting these into our gates to subtract. We need C for M because 1 denotes subtractor, if M was 0, it's an adder.

11. 0110 ⇒ 0110
1010 +0110
$\boxed{1100} = \boxed{-4}$
At this point there should be no carry so C=0

$\boxed{\text{Ans A and D}}$

12. Ans is C/E

C) If the output carry = 1 then add 0011
E) if the input carry = 1 then add 1101

13. $w\bar{x}y\bar{z} + \bar{w}xy\bar{z} + w\bar{x}\bar{y}z + \bar{w}x\bar{y}z$

yz \ wx	00	01	11	10
00	0	0	0	0
01	0	1	0	1
11	0	0	0	0
10	0	1	0	1

$w\bar{x}y\bar{z} + \bar{w}xy\bar{z} + w\bar{x}\bar{y}z + \bar{w}x\bar{y}z$

$= w\bar{x}y\bar{z} + \bar{w}x\bar{y}z + \bar{w}xy\bar{z} + w\bar{x}\bar{y}z$

$\boxed{= \overline{w \circledR x \circledR y \circledR z}}$