Discrete Math Homework

(1) 20. $\log(n+1)$ is $O(\log(n))$
$\log(n^2+1)$ is NOT $O(\log(n))$

(2) 46. if $f_1(x)$ & $f_2(x)$ are $O(g_1(x))$ & $O(g_2(x))$
$(f_1 f_2)(x)$ is $O(g_1 g_2)(x)$ respectively
$n \wedge n^2$ $n^2 \wedge n^3$
$(g_1 g_2)(x)$ will always dominate $(f_1 f_2)(x)$

(3) 2. $t = a_n + n\sum_1^n i + \sum_i^2 j$

(4) 16. a) $\log n \cdot 10^{-11} = \#$ $\frac{24 \cdot 60 \cdot 60}{\#} = 1$ $\frac{24 \cdot 60 \cdot 60}{10^{-11}} = \log n$

(5) 16. b) $1000n \cdot 10^{-11} = \#$ $\frac{24 \cdot 60 \cdot 60}{\#} = 1$ $\frac{24 \cdot 60 \cdot 60}{10^{-11}} = 1000n$

(6) 16. f) $2^n \cdot 10^{-11} = \#$ $\frac{24 \cdot 60 \cdot 60}{\#} = 1$ $\frac{24 \cdot 60 \cdot 60}{10^{-11}} = 2^n$

(7) 40. a) bubble sort $\log n \to \log(2n)$ the larger then the smaller the change, it gets closer to 1

(8) 14. a) $a = 11 \pmod{19} \wedge b = 3 \pmod{19}$
$13 \cdot 11 \pmod{19} = 143 \pmod{19} = 10$

(9) 14. f) $a^3 + 4b^3 \pmod{19}$
$(13^3 + 4 \cdot 9) \pmod{19} = (10)$

(10) 24. a) $a = 43 \pmod{23} = 20$

(11) 32. a) $33 \pmod 9 = 5$

(12) 34. $a \equiv b \pmod m \wedge c \equiv d \pmod m \wedge m \in Z$
$a - c \equiv b - d \pmod m$
$21 \equiv 6 \pmod 4 \wedge 1 \equiv 5 \pmod 4$
$21 - 1 \equiv 6 - 5 \pmod 4 \Rightarrow 1 = 1$

(13) 6. a) $(1111\ 0111) \Rightarrow 7 + 4 + 8 + 0 + 32 + 64 + 128 + 256 =$ 756

(14) 10 b) $(1010\ 1010\ 1010) \Rightarrow$ AAA

(15) $3^{42} \pmod 5 = 4$ (used calculator)

(16) $2^{42} \pmod 5 = 1$
2^{42} ends in a 4 so mod 5 = 1