Set #5 10 points

(1) 3.3.1
(2) 3.3.4
(3) 3.3.5
(4) For each $n \in \mathbb{N}$, the nth harmonic sum is given by

$$H_n = 1 + \frac{1}{2} + \frac{1}{3} + \cdots + \frac{1}{n}$$

So for example,

$$H_{2^3-1} = 1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5} + \frac{1}{6} + \frac{1}{7}$$

(a) Prove by induction that $H_{2^n} \geq 1 + n/2$.

(b) Prove by induction that $H_{2^n-1} \leq n$

(5) 3.4.1
(6) 3.4.2
(7) 3.4.4
(8) 3.4.6
(9) 3.4.7