Due: On Blackboard, 6pm, Friday, February 8

1. Page 419, problem 74
2. Page 436, problem 38
3. Page 444, problem 24; also, explain the name “hexagon identity”
4. Page 444, problem 32; also, prove this by induction
5. Page 457, problem 60, parts (a) and (d)
6. Consider the combinatorial identity
   \[ \binom{\binom{k}{2}}{2} = 3 \binom{k + 1}{4}. \]

   (a) Prove this identity by algebraic manipulation.
   (b) Give a combinatorial proof. (Hint: The lefthand side counts the number of combinations of two combinations of \(k\) items taken two at a time. Consider the following algorithm for generating such an item: Take the \(k\) items and add a \(k + 1\)st element “DUP”. Each pair of combinations of \(k\) items taken two at a time can be obtained by choosing 4 items from the expanded set of \(k + 1\) elements. If none of those four is DUP, there are 3 possible pairs of combinations of two items (why?). If one of those items is DUP, any one of the three other items can be duplicated to get a total of 4 elements. In that case, how many possible pairs of combinations of two items are there?)