McGill COMP251 Fall 2009: Exercises on induction

In the following exercises, the statements $S(n)$ that you are proving are equalities involving n. These may look different from the statements about the correctness of algorithm, but the structure of the induction proofs is the same. (Keep in mind that induction is not the only way you can use to derive these equalities.)

1) Read the text Chapter A.2. Prove the formulas (A.1), (A.3), (A.4), (A.5), (A.9) by induction on n.

2) Find the formulas for A.1-7 and A.1-8, and prove them by induction on n.

3) Let c be a positive constant, $c \neq 1$. Prove the following equality by induction on n, for $n \geq 1$.

$$1 + 2c + 3c^2 + \ldots + nc^{n-1} = \frac{nc^{n+1} - (n+1)c^n + 1}{(c-1)^2}$$