MAT 2345 Induction Proof Worksheet # 1

Write your answers on a separate paper.

1. What is the error in this induction proof?

   Let $P(n)$ be the proposition $n = n + 1 \ \ \forall n > 0$. Assume $n = n + 1$ for some arbitrary $n > 0$. Add 1 to both sides of this equation to obtain $n+1 = n+2$. Since this is the statement for $P(n + 1)$, it follows that $P(n)$ is true $\forall n > 0$.

Provide induction proofs for each of the following, using the same technique presented in lecture. Be sure to **label** all parts and include **reasons** for each step. Staple solutions together in order given.

2. $\sum_{i=1}^{n} 5 \ = \ 5n \ \ \forall \ n \geq 1$

3. $7|(11^n - 4^n) \quad \forall \ n \geq 0$

4. $\sum_{i=1}^{n} i2^i \ = \ (n-1)2^{n+1} + 2 \ \ \forall \ n \geq 1$

5. $\sum_{i=1}^{n} (2i-1) \ = \ n^2 \ \ \forall \ n \geq 1$

6. Find the sum (in closed form) and prove your claim using induction.
   Hint: rewrite as a summation, distribute i, and apply definition of summations:

$$1(2) + 2(3) + 3(4) + \ldots + n(n+1) \ =$$