On separate paper, 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.

1. $1 + \dfrac{1}{4} + \dfrac{1}{9} + \ldots + \dfrac{1}{n^2} < 2 - \dfrac{1}{n}, \quad \forall\, n \geq 2$

2. $6\,|\,(n^3 - n) \quad \forall\, n \geq 0$

3. $n^2 - 7n + 12 \geq 0 \quad \forall\, n > 3$

4. $\displaystyle\sum_{i=0}^{n}(2i+1)^2 \;=\; \dfrac{(n+1)(2n+1)(2n+3)}{3} \quad \forall\, n \geq 0$

5. $\displaystyle\sum_{i=0}^{n}3(5^i) \;=\; \dfrac{3(5^{n+1}-1)}{4} \quad \forall\, n \geq 0$

6. $\displaystyle\sum_{i=1}^{n}\dfrac{1}{i(i+1)} \;=\; \dfrac{n}{n+1} \quad \forall\, n \geq 1$

7. $\displaystyle\sum_{i=1}^{n} i2^{i-1} \;=\; (n-1)2^n + 1 \quad \forall\, n \geq 1$