

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.

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

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

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

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

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

$$6. \sum_{i=1}^n \frac{1}{i(i+1)} = \frac{n}{n+1} \quad \forall n \geq 1$$

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