Proofs of summation formulas

Name: _____ Date: _____

6 questions | 36 marks

1. Prove $1 + 2 + \cdots + n = n(n+1)/2$ for all integers $n \geq 1$. [6 marks]

(a) Verify the first case and state the induction hypothesis. [2 marks]

(b) Prove the next case and conclude. [4 marks]

2. Prove $1 + 3 + \cdots + (2n-1) = n^2$ for all integers $n \geq 1$. [6 marks]

(a) Verify the first case and state the induction hypothesis. [2 marks]

(b) Prove the next case and conclude. [4 marks]

3. Prove $\sum_{r=1}^{n} r^2 = n(n+1)(2n+1)/6$ for all integers $n \geq 1$. [6 marks]

(a) Verify the first case and state the induction hypothesis. [2 marks]

(b) Prove the next case and conclude. [4 marks]

4. Prove $\sum_{r=1}^{n} r^3 = [n(n+1)/2]^2$ for all integers $n \geq 1$. [6 marks]

(a) Verify the first case and state the induction hypothesis. [2 marks]

(b) Prove the next case and conclude. [4 marks]

5. Prove $\sum_{r=1}^{n} 1/[r(r+1)] = n/(n+1)$ for all integers $n \geq 1$. [6 marks]

(a) Verify the first case and state the induction hypothesis. [2 marks]

(b) Prove the next case and conclude. [4 marks]

6. Prove $\sum_{r=1}^{n} r(r+1) = n(n+1)(n+2)/3$ for all integers $n \geq 1$. [6 marks]

(a) Verify the first case and state the induction hypothesis. [2 marks]

(b) Prove the next case and conclude. [4 marks]