

## 2) (10 pts) ANL (Summations)

a) (5 pts) Determine the value of the following summation, in terms of  $n$ :  $\sum_{i=1}^{2n} (4i + 7)$ . Express your final answer as a polynomial in the form  $an^2 + bn$ , where  $a$  and  $b$  are integers.

$$\begin{aligned}
 \sum_{i=1}^{2n} (4i + 7) &= \left( 4 \sum_{i=1}^{2n} i \right) + \sum_{i=1}^{2n} 7 \\
 &= 4 \times \frac{2n(2n+1)}{2} + 7(2n) \\
 &= 2(2n)(2n+1) + 14n \\
 &= 8n^2 + 4n + 14n \\
 &= 8n^2 + 18n
 \end{aligned}$$

**Grading: 1 pt for split, 2 pts for sum to i formula, 1 pt sum constant, 1 pt simplify**

b) (5 pts) Determine the value of the summation below:

$$\begin{aligned}
 \sum_{i=21}^{100} (3i + 1) &= \sum_{i=1}^{100} (3i + 1) - \sum_{i=1}^{20} (3i + 1) \\
 &= \sum_{i=1}^{100} (3i) + \sum_{i=1}^{100} 1 - (\sum_{i=1}^{20} (3i) + \sum_{i=1}^{20} 1) \\
 &= 3 \times \frac{100 \times 101}{2} + 100 - (3 \times \frac{20 \times 21}{2} + 20) \\
 &= 3 \times 50 \times 101 + 100 - 3 \times 10 \times 21 - 20 \\
 &= 3 \times 5050 + 100 - 30 \times 21 - 20 \\
 &= 15150 + 100 - 630 - 20 \\
 &= 14600
 \end{aligned}$$

**Grading (5 pts total): 1 pt for splitting sum, 3 pts for properly plugging into formulas for both sums, 1 pt for simplification**