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Worksheet week 1 - MAC 2312, Spring 2014

1. (5 pts) (a) Find a closed form for the sum  $1 + 3 + 5 + \dots + (2n - 1)$ .  
(b) Find the exact value of the sum  $101 + 103 + 105 + 107 + \dots + 999$ .

2. (6 pts) Complete the proof of

$$1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6},$$

following the sketch below (also given in class):

- (a) On one hand, using the telescopic sum technique, show that  $\sum_{k=1}^n ((k+1)^3 - k^3) = (n+1)^3 - 1$ .

(b) On the other hand, by expanding the cube inside, show that 
$$\sum_{k=1}^n \left( (k+1)^3 - k^3 \right) = 3 \sum_{k=1}^n k^2 + 3 \sum_{k=1}^n k + \sum_{k=1}^n 1 .$$

(c) Use parts (a) and (b) and some algebra to get the required sum.