CSCI-C 241 HW #13 Assigned Thursday, November 29th, 2018
Instructor: Wennstrom Due Tuesday, December 4th, 2018

1. Compute the following values. You should *not* use a calculator for this problem. These are all simple enough that you don't really need one anyway. I can't stop you from using one on your homework, but you won't be able to use it on the final exam, so you should get some practice now.

   (a) $\sum_{i=1}^{4} 2i$

   (b) $\sum_{i=0}^{3} (2^i + i^2)$

   (c) $\sum_{i=1}^{3} \frac{1}{i}$ Write your answer as a single fraction (I don't care if it's simplified, but it has to be just one fraction with no decimals).

2. Use mathematical induction to prove the following claims:

   (a) For all natural numbers $n \geq 2$, $3^n > n^2$.

   (b) For all natural numbers $n \geq 7$, $3^n < n!$. (Feel free to use a calculator for the base step.)

   Hint: $(n+1)! = (n+1) \cdot n!$

   (c) For all natural numbers $n \geq 1$, $\sum_{i=1}^{n} 2i = n(n+1)$.

   (d) For all natural numbers $n \geq 1$, $\sum_{i=1}^{n} 2^{i-1} = 2^n - 1$.

   (e) For all $n \in \mathbb{N}$, $\sum_{i=0}^{n} i! \cdot i = (n+1)! - 1$.

   (f) For all $n \in \mathbb{N}$, $n^2 - 3n$ is even. (Note: It is possible to prove this *without* induction. In fact, it might even be *easier* to prove it without induction. But for this assignment, you *must* provide an induction proof.)