## Problem Set 9

## Due: April 17

## Reading: Chapter 13. Asymptotics

## Problem 1.

Assuming the following sum equals a polynomial in $n$, find the polynomial. Optionally, you might want to use induction to prove that the sum equals the polynomial you find, but no such proof is required for full credit.

$$
\sum_{i=1}^{n} i^{3}
$$

## Problem 2.

Show that

$$
\ln \left(n^{2}!\right)=\Theta\left(n^{2} \ln n\right)
$$

Hint: Stirling's formula for $\left(n^{2}\right)!$.

## Problem 3.

Prove that

$$
\sum_{k=1}^{n} k^{6}=\Theta\left(n^{7}\right)
$$

Hint: One solution uses the Integral Method, and there are other workable approaches that avoid calculus.

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