[40] **Homework 1**: *Big O, Ω.*

Due: January 26, by the end of class.

[15] Select the best "big Oh" notation for each expression. Justify by showing the constants c and n_0. Note that $f(n) = O(g(n))$ if there are constants $c > 0$ and $n_0 > 0$ so that for all $n \geq n_0$ we have $|f(n)| \leq c \cdot g(n)$.

1. $10n + 1$.
2. $(10n + 1)^2$.
3. $6n^3 - 12n^2 - 1$.
4. $2 + 4 + 6 + \ldots + 2n$.
5. $n^2 + \sqrt{n} + \log n$.

[15] Show that the following equalities are correct:

$$\begin{aligned} 5n^2 - 6n &= \Theta(n^2) \\ n! &= O(n^n) \\ \sum_{i=0}^{n} i^2 &= \Theta(n^3) \\ \frac{6n^2}{\log n + 1} &= O(n^3) \\ 33n^3 + 4n^2 &= \Omega(n^2) \end{aligned}$$

[5] Is $n^2(1 + \sqrt{n}) = O(n^2)$? Justify your answer?

[5] Is $(\log n)^2 = O(\log n^2)$? Justify your answer?