CSE 2321: Homework 9 Solutions

1. Let $n \geq 1$, then
\[
4n^2 - 12n + 10 \leq 4n^2 + 10 \\
\leq 4n^2 + 10n^2 \\
= 14n^2.
\]
\therefore 4n^2 - 12n + 10 \in O(n^2) \text{ with } c = 14 \text{ and } n_0 = 1.

2. Let $n \geq 1$, then
\[
5n^5 - 4n^4 - 2n^2 + n \leq 5n^5 + n \\
\leq 5n^5 + n^5 \\
= 6n^5.
\]
\therefore 5n^5 - 4n^4 - 2n^2 + n \in O(n^5) \text{ with } c = 6 \text{ and } n_0 = 1.

3. Let $n \geq 1$, then $4n^2 + n + 1 \geq 4n^2$.
\therefore 4n^2 + n + 1 \in \Omega(n^2) \text{ with } c = 4 \text{ and } n_0 = 1.

4. Let $n \geq 1$, then
\[
n^5 + n^3 + 7n + 1 \leq n^5 + n^5 + 7n^5 + n^5 = 10n^5
\]
and
\[
n^5 + n^3 + 7n + 1 \geq n^5.
\]
Hence, $n^5 \leq n^5 + n^3 + 7n + 1 \leq 10n^5$.
\therefore n^5 + n^3 + 7n + 1 \in \Theta(n^5) \text{ with } c_1 = 1 \text{ and } c_2 = 10 \text{ and } n_0 = 1.

5. Let $n \geq 2$, then
\[
n^3 + \sqrt{n} \sin(n) + n \log(n) \leq n^2 + (n)(n) + (n)(n) = 3n^2.
\]
\therefore n^3 + \sqrt{n} \sin(n) + n \log(n) \in O(n^2) \text{ with } c = 3 \text{ and } n_0 = 2.