**1.** An algorithm has running time $T(n) = 5 \cdot 10^{-9}(n^3)$. Provide an expression that gives the largest problem size $n$ that can be processed by the algorithm within on week.

One week contains 604800 seconds. Thus we obtain $n = \sqrt[3]{\frac{604800 \cdot 10^9}{5}}$.

**2.** Suppose that the Insertion Sort sorting algorithm has a running time of $T(n) = 8 \cdot n^2$, while the Counting Sort algorithm has a running time of $T(n) = 64 \cdot n$. Find the largest postive input size for which Insertion Sort runs at least as fast as Counting Sort. Show all work.

$$\begin{aligned} 8 \cdot n^2 &\leq 64 \cdot n \\ n &\leq 8 \end{aligned}$$

$n = 8$

**3.** Provide a summation expression that models the running time $T(n)$ of the sophomore algorithm.

$$\begin{aligned} \sum_{i=1}^{n} \sum_{j=i}^{n-1} c &= \sum_{i=1}^{n} c \cdot (n - 1 - i + 1) \\ &= \sum_{i=1}^{n} O(n) \\ &= O(n^2) \end{aligned}$$