1. *Big-Oh my!* You have been asked to choose one of two possible algorithms. You are given just two facts. First, one algorithm has an asymptotic running time of $O(n^{1.1})$ and the other $O(n \log_2 n)$. Secondly, $n$ will be really huge. Which would you choose and why?

2. *Probability.* Suppose you roll a pair of 6-sided dice. What is the probability that the sum of pairs’ values will be even?

3. *Calculus.* Consider the following function:

$$
\Gamma(a) = \int_0^\infty t^{a-1} e^{-t} \, dt.
$$

Show that $\Gamma(a) = (a - 1)\Gamma(a - 1)$.

4. *Algorithms and data structures.* Consider an undirected graph $G = (V, E)$, where $V$ is the set of its vertices and $E$ its edges. We say $G$ is *bipartite* if there exists a partitioning of the vertices, $V = V_1 \cup V_2$, such that

   a. $V_1 \cap V_2 = \emptyset$, that is, $V_1$ and $V_2$ are disjoint; and
   
   b. for every edge $(u, v) \in E$, $u \in V_1$ and $v \in V_2$ or $v \in V_1$ and $u \in V_2$.

That is, all edges go between $V_1$ and $V_2$, and no edges lie wholly within a single partition.

Give an algorithm to check whether a graph is bipartite.