1. Consider a consumer with quasi-linear preferences represented by the utility function:
\[ U(c, g) = c + \sqrt[3]{g} \]
where \( c \) is a private good and \( g \) is a pure public good. The price of the private good is $12 per unit and the price of the public good $1. Assume the consumer has $1,000 to spend. Calculate the utility maximizing quantities of \( c^* \) and \( g^* \).

2. Now assume that the consumer has $1,800 to spend. How will the change in income affect the optimal quantities of \( c \) and \( g \). Why?

3. Now the utility function is \( U(c, g) = 5c + \sqrt{g} \) and the consumer has $1,500 to spend. Find the values of \( c \) and \( g \) that maximize his utility.

4. FIU offers bus service between the Modesto Maidique Campus and the Biscayne Campus. Suppose that a bus arrives at the Golden Parking Garage every 30 minutes between 6AM and 11PM during weekdays. Students arrive at the bus stop at random times. The time students wait is uniformly distributed from 0 to 30 minutes.

   a. Draw a graph of this distribution.
   b. Show that the area of this distribution is 1.00.
   c. What is the mean waiting time? What is the standard deviation of the waiting time?
   d. What is the probability a student will wait more than 25 minutes?
   e. What is the probability a student will wait between 10 and 20 minutes?

5. The following data is about the earnings per share of a sample of 15 software companies for the year 2013.

\[
\begin{array}{cccccc}
\$0.09 & \$0.13 & \$0.41 & \$0.51 & \$1.12 \\
\$1.20 & \$1.49 & \$3.18 & \$3.50 & \$6.36 \\
\$7.83 & \$8.92 & \$10.13 & \$12.99 & \$16.40 \\
\end{array}
\]
Compute the mean, median and standard deviation. Find the coefficient of skewness using Pearson’s estimate and also the software method. What is your conclusion regarding the shape of the distribution?

6. Consider three voters indexed by \( i \in \{1, 2, 3\} \), each characterized by an intrinsic parameter \( a^i \), where \( a^1 < a^2 < a^3 \). Agent \( i \) derives a utility \( W(q^j; a^i) \) over policy \( q^j \). Three possible policies \( q^j \in \{q^1, q^2, q^3\} \) can be implemented. A policy is selected by simple majority rule.

The preferences of agent \( i \in \{1, 2, 3\} \) are such that
\[
W(q^1; a^1) > W(q^3; a^1) > W(q^2; a^1) \\
W(q^2; a^2) > W(q^1; a^2) > W(q^3; a^2) \\
W(q^3; a^3) > W(q^2; a^3) > W(q^1; a^3)
\]

Moreover, the agenda is open and agents vote sincerely. Prove that no Condorcet winner exists under majority rule. Discuss.

7. Suppose that the agents have the same preferences as in (6) but agent 2 is the agenda setter. He selects two rounds in which all agents vote sincerely. What is the optimal agenda from the perspective of agent 2? Suppose now that agent 2 sets the agenda and agents 1 and 3 vote sincerely. Which agent can improve his welfare by voting strategically? Discuss.

8. Suppose that the agents have the following preferences:
\[
W(q^1; a^1) > W(q^2; a^1) > W(q^3; a^1) \\
W(q^2; a^2) > W(q^1; a^2) > W(q^3; a^2) \\
W(q^3; a^3) > W(q^2; a^3) > W(q^1; a^3)
\]

with \( q^1 < q^2 < q^3 \).

Is there a Condorcet winner? Explain.