1. Find all local minima, local maxima and saddle points for $f(x_1, x_2) = x_1^3 - 3x_1x_2 + x_2^2$.

2. Find all local minima, local maxima and saddle points for $f(x_1, x_2, x_3) = x_1x_2 + x_2x_3 + x_3x_1$.

3. Use Golden Section Search to determine (within an interval of 0.6) the optimal solution to

$$\max_{x \in \mathbb{R}} \quad x - e^x$$

s.t. $-1 \leq x \leq 3$

4. Consider a unimodal function $f(x) : \mathbb{R} \to \mathbb{R}$ over the interval $[0, 10]$. To maximize the function over this interval and find a solution within an interval of uncertainty of $10^{-10}$, how many iterations of Golden Section Search are needed?

5. A company has $n$ factories. Factory $i$ (for $i = 1, 2, \ldots, n$) is located at point $(x_i, y_i)$ in the two-dimensional plane $\mathbb{R}^2$. The company wants to locate a warehouse at a point $(x, y)$ that minimizes

$$\sum_{i=1}^{n} (\text{distance from factory } i \text{ to the warehouse})^2$$

Where should the warehouse be located?