Problem 1

Consider the function \( f(x) = \sqrt{x} - \ln x \), defined on the interval \((0, \infty)\).

1. On what interval(s) is \( f(x) \) increasing? Decreasing?
2. On what interval(s) is \( f(x) \) concave up? Concave down?
3. Find all local and global minima and maxima of \( f(x) \).

Problem 2

Is \( \sqrt{x} > \ln x \) for all \( x > 0 \)?

Problem 3

Let \( g(x) = \sin^3(x) \) on the interval \((-\pi, \pi)\).

1. On what interval(s) is \( f(x) \) increasing? Decreasing? What are its critical numbers?
2. Determine whether each critical point is a local minimum, a local maximum, or neither.
3. Sketch a graph of \( f(x) \).

Problem 4

1. Find two positive numbers whose product is 100 and whose sum is a minimum.
2. A poster is to have an area of 180 in\(^2\) with 1-inch margins at the bottom and sides and a 2-inch margin at the top. What dimensions will give the largest printed area?