Optimization Practice

Name: _____

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Steps for Optimization Problems

1. **Read the problem**! Identify the quantity to be optimized.
2. **Draw a picture** representing the problem. Label any part that is relevant to the problem.
3. **Introduce variables**. List every relation in the picture and in the problem as an equation or expression, and identify the unknown variables.
4. **Write an equation for the quantity you want to optimize**. Use your relations from the previous step to turn it into a function of a single variable. This may require considerable manipulation.
5. **Solve the problem**. Determine the domain of your function. Use the first and second derivative tests to identify and classify the critical points. Check critical points and endpoints to find the optimal value.

(1) Find the dimensions of a rectangle with area of 1,000 square meters whose perimeter is as small as possible.

(2) A box with a square base and an open top must have a volume of 32,000 cubic centimeters. Find the dimensions of the box that minimize the amount of material used.

(3) Find the point on the line $3x + y = 9$ that is closest to the point $(-3, 1)$.

(4) A rectangle storage container with an open top is to have a volume of 10 cubic meters. The length of its base is twice the width. Material for the base costs $10 per square meter. Material for the sides costs $6 per square meter. Find the cost of the material for the cheapest such container.