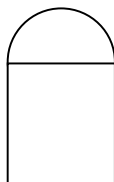


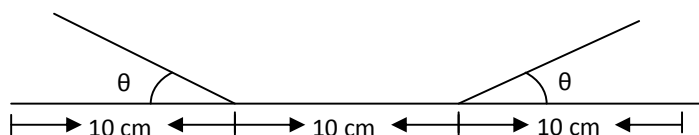
Math 111 Optimization Worksheet

For each problem, find the correct answer(s) **and** justify that the answer(s) you found are indeed the appropriate absolute extrema.

1. Find the absolute extrema of $f(x) = 3x^4 - 16x^3 + 18x^2$ on the interval $-1 \leq x \leq 4$.
2. Find the absolute extrema of $f(t) = t^{1/3}(8 - t)$ on the interval $0 \leq t \leq 8$.
3. Find the absolute extrema of $g(x) = x^{3/4} - 2x^{1/4}$ on $(-\infty, \infty)$.
4. Find a positive number such that the sum of the number and its reciprocal is as small as possible.
5. A Norman window has the shape of a rectangle surmounted by a semicircle. If the perimeter of the window is 30 ft, find the dimensions of the window so that the greatest possible amount of light is admitted.



6. A box with an open top is to be constructed from a square piece of cardboard, 3 ft wide, by cutting out a square from each of the four corners and bending up the sides. Find the largest volume that such a box can have.
7. A rectangular 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 materials for the cheapest such container.
8. A rain gutter is to be constructed from a metal sheet of width 30cm by bending up one-third of the sheet on each side through an angle θ . How should θ be chosen so that the gutter will carry the maximum amount of water?



9. A woman at a point A on the shore of a circular lake with radius 2 mi wants to arrive at the point C diametrically opposite A on the other side of the lake in the shortest possible time. She can walk at the rate of 4 mi/h and row a boat at 2 mi/h. How should she proceed? (Recall: time = distance / rate)

