Homework 4/7

For each problem in this assignment you will refer to a problem from your text, Section 4.5. In
stead of the text’s instructions, follow these steps for each problem.

• State what quantity is to be minimized or maximized.

• Name it. (Pick a letter.)

• Write it as a function. (Input letter will depend on your choices as you set up the problem.)

• State the domain of the function.

• Graph the function on your stated domain.

• Algebraically verify that you have exactly located the minimum or maximum value. There are
  many techniques for this, but at the very least you must show work that locates the critical
  points of your function, and then you must show additional work of some kind that verifies
  you have located the appropriate maximum or minimum.

• Answer the textbook’s question.

1. Section 4.5: 13.

2. Section 4.5: 34(a). Assume that the proportionality constant is $k$.

3. Repeat Section 4.5: 34(a), but assume that the diameter of the log is another unknown
  constant, $c$.

4. Section 4.5: 22. Assume that the total perimeter of the window is $P$. For the window that
  admits the most light, compute the width and height of the rectangular portion and the radius
  of the semicircular portion.

5. Section 4.5: 23. Assume that the total volume is $V$. For the cheapest silo, compute the radius
  and height of the cylindrical portion.

Selected Answers

2. Width $3\sqrt{3}$ in. Depth $3\sqrt{6}$ in.

3. Width $c\sqrt{3}/3$ in. Depth $c\sqrt{6}/3$ in.

4. Width $\frac{4P}{8 + 3\pi} \approx .230P$. Height $\frac{(4 + \pi)P}{16 + 6\pi} \approx .205P$. Radius $\frac{2P}{8 + 3\pi} \approx .115P$. 