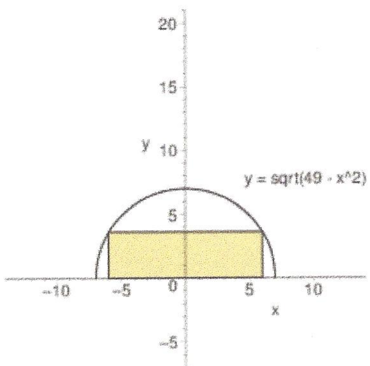
4.7

7.

A rectangle is bounded by the x-axis and the semicircle $y = \sqrt{49 - x^2}$ (see figure). What length and width should the rectangle have so that its area is a maximum?

(smaller value)

(larger value)



4. ·

Find the length and width of a rectangle that has the given perimeter and a maximum area.

Perimeter: 80 meters

length [ ] m

width [ ] m

5. -/1 pointsLarCalcET6 4.7.015.

Find the point on the graph of the function that is closest to the given point.

$f(x) = \sqrt{x}$, (2, 0)

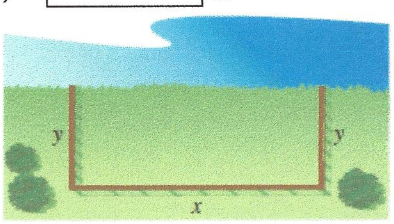
$(x, y) = ($ [ ] , [ ] $)$

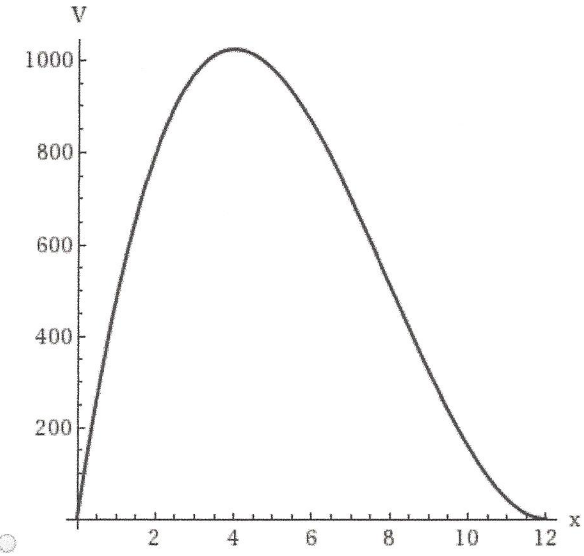
6. -/2 pointsLarCalcET6 4.7.019.

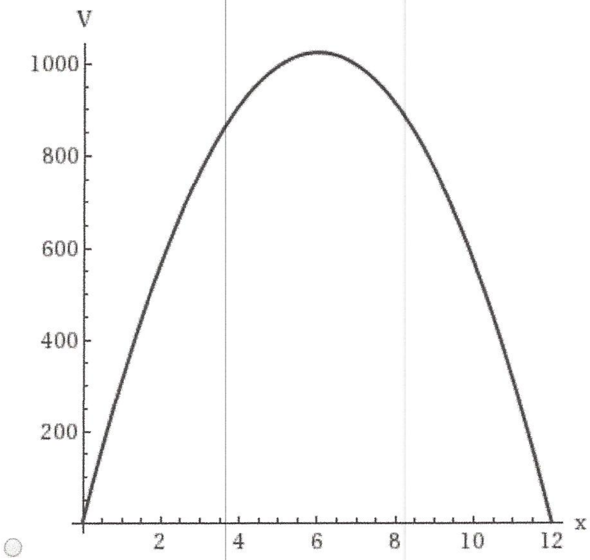
A farmer plans to enclose a rectangular pasture adjacent to a river (see figure). The pasture must contain 405,000 square meters in order to provide enough grass for the herd. No fencing is needed along the river. What dimensions will require the least amount of fencing?

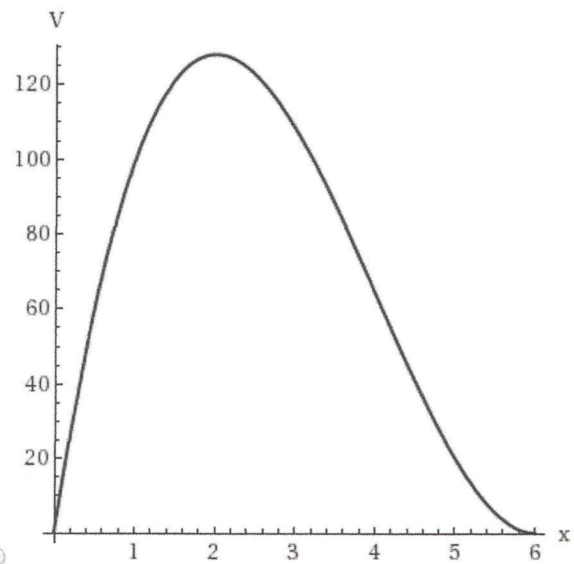
x = [ ] m

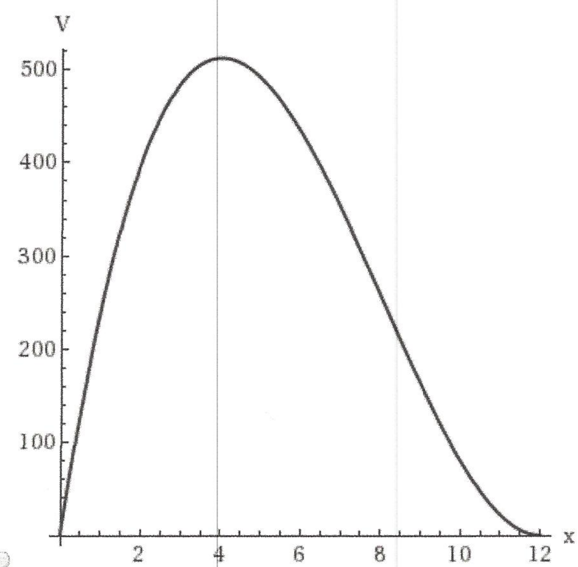
y = [ ] m











3. –/2 pointsLarCalcET6 4.7.005.

Find two positive numbers satisfying the given requirements.

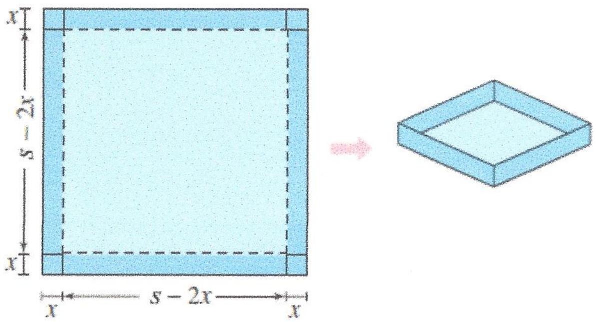
The product is 432 and the sum of the first plus three times the second is a minimum.

[ ] (first number)

[ ] (second number)

2.

An open box of maximum volume is to be made from a square piece of material, s = 24 inches on a side, by cutting equal squares from the corners and turning up the sides (see figure).



(a) Analytically complete six rows of a table such as the one below. (The first two rows are shown.)

Height, x	Length and Width	Volume, V
1	24 − 2(1)	$1[24 - 2(1)]^2 = 484$
2	24 − 2(2)	$2[24 - 2(2)]^2 = 800$
3	24 − 2(3)	$3[24 - 2(3)]^2 =$
4	24 − 2(4)	$4[24 - 2(4)]^2 =$
5	24 − 2(5)	$5[24 - 2(5)]^2 =$
6	24 − 2(6)	$6[24 - 2(6)]^2 =$

Use the table to guess the maximum volume.

$V =$

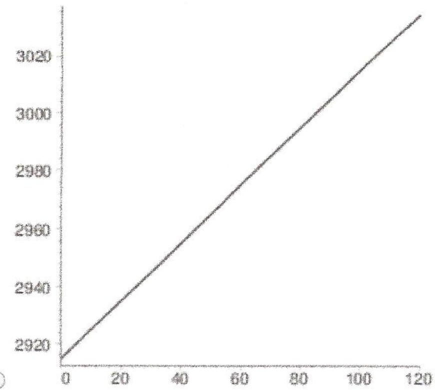
(b) Write the volume V as a function of x.

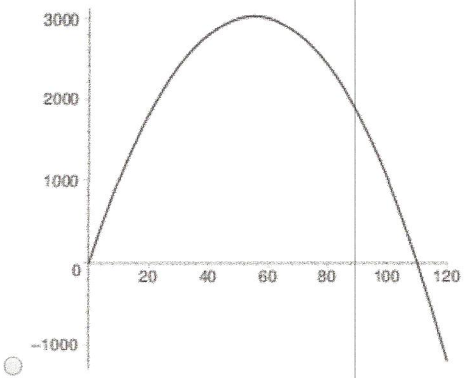
$V =$ $0 < x < 12$

(c) Use calculus to find the critical number of the function in part (b) and find the maximum value.

$V =$

(d) Use a graphing utility to graph the function in part (b) and verify the maximum volume from the graph.





Estimate the solution from the graph.

$x \approx$ [ ]

(e) Use calculus to find the critical number of the function in part (c). Then find the two numbers.

[ ] (smaller value)

[ ] (larger value)

1.

Find two positive numbers whose sum is 110 and whose product is a maximum.

(a) Analytically complete six rows of a table such as the one below. (The first two rows are shown.)

First Number, x	Second Number	Product, P
10	110 − 10	10(110 − 10) = 1000
20	110 − 20	20(110 − 20) = 1800
30	110 − 30	30(110 − 30) =
40	110 − 40	40(110 − 40) =
50	110 − 50	50(110 − 50) =
60	110 − 60	60(110 − 60) =

(b) Use a graphing utility to generate additional rows of the table.

First Number, x	Second Number	Product, P
70		
80		
90		
100		

Use the table to estimate the solution. (*Hint:* Use the table feature of the graphing utility.)

$x \approx$

(c) Write the product P as a function of x.

$P(x) =$

(d) Use a graphing utility to graph the function in part (c).