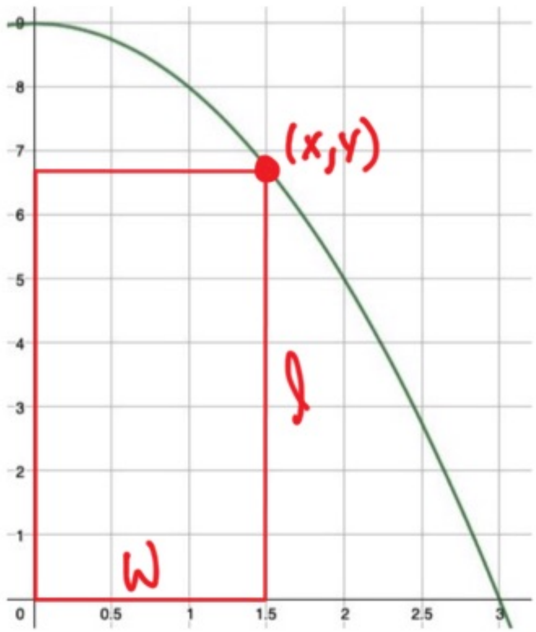
Application: Inscribed Shapes

1.Sketch
2.Write everything you know about the problem
3.Combine to make a function in one variable.
4.Use function with technology to answer question

What is the largest area of a rectangle that can be inscribed in the first quadrant and below the curve $y=-x^2+9$



$A = l \cdot w$

$W = x$

$l = -x^2+9$

$A(x) = x(-x^2+9)$

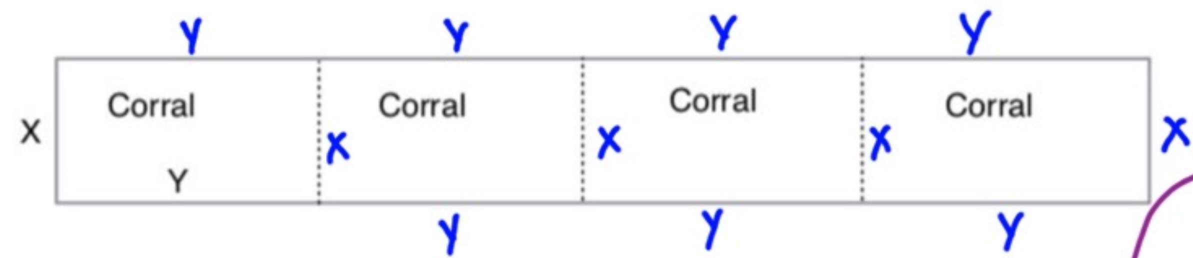
$A(x) = -x^3+9x$

When "x" is 1.732 then 10.392 units^2

(scroll to see digital graph.)

Application: Greatest Area

Suppose you have to build some adjacent hamster corrals as shown below. Each corral needs to be same size. Horizontal portions of the corral are (Y) and the vertical portions are (X). You have 1200 feet of fencing to work with.



$A = 4 l \cdot w$

$A = 4 x \cdot y$

$A = 4(x)\left(\frac{-5x+1200}{8}\right)$

$P = 5x + 8y$

$1200 = 5x + 8y$

$y = \frac{-5x+1200}{8}$

a. What is the Area Function of ALL the corral in terms of "x"?

$A(x) = -2.5x^2 + 600x$

b. What is the greatest area of all the corrals you can build based on the scenario above?

36000 ft^2

c. What would the dimensions of a single corral be?

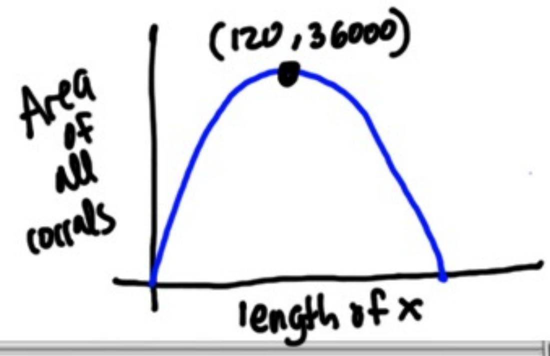
one corral is 9000 ft^2, so...

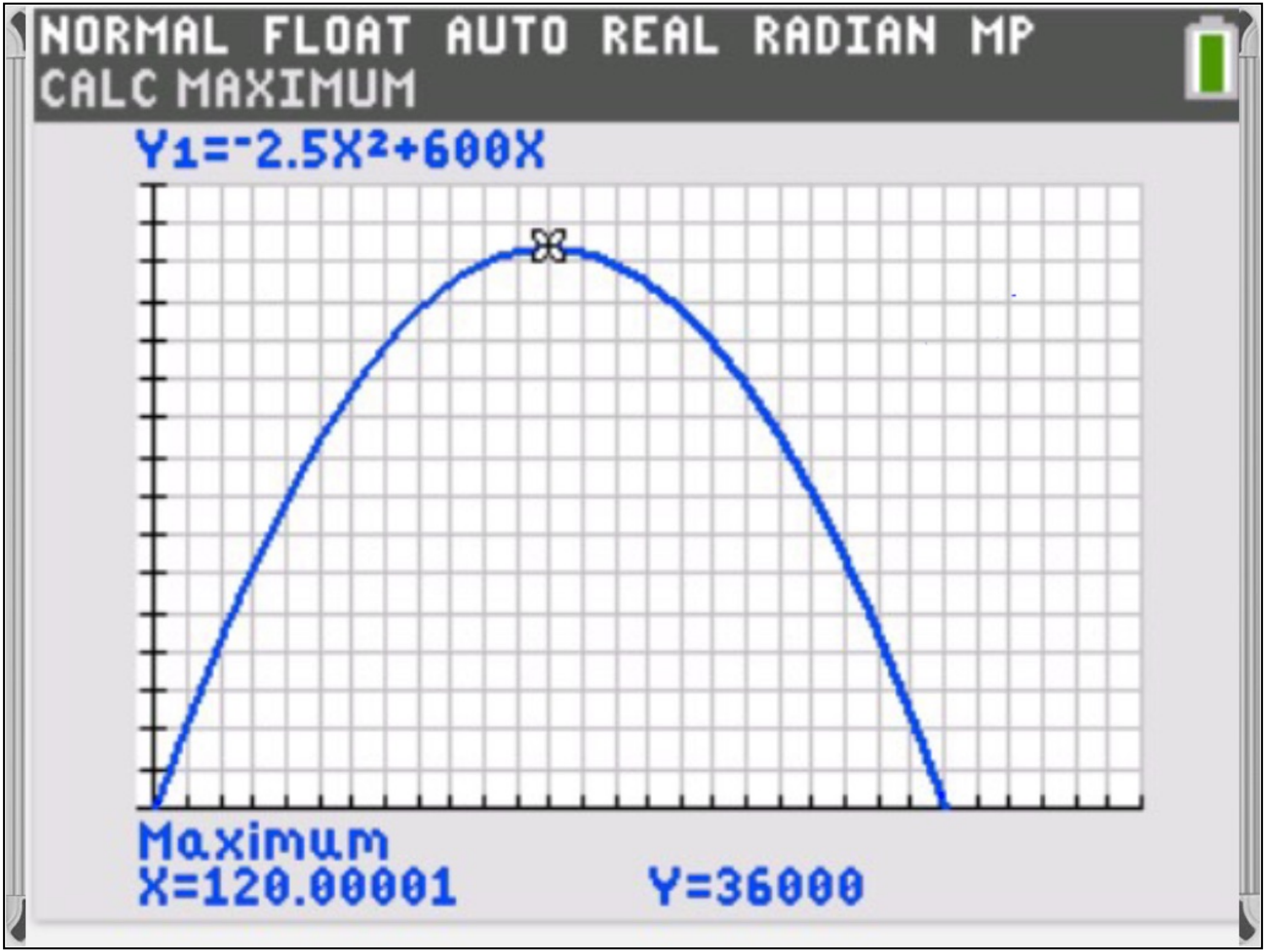
$A = l \cdot w$

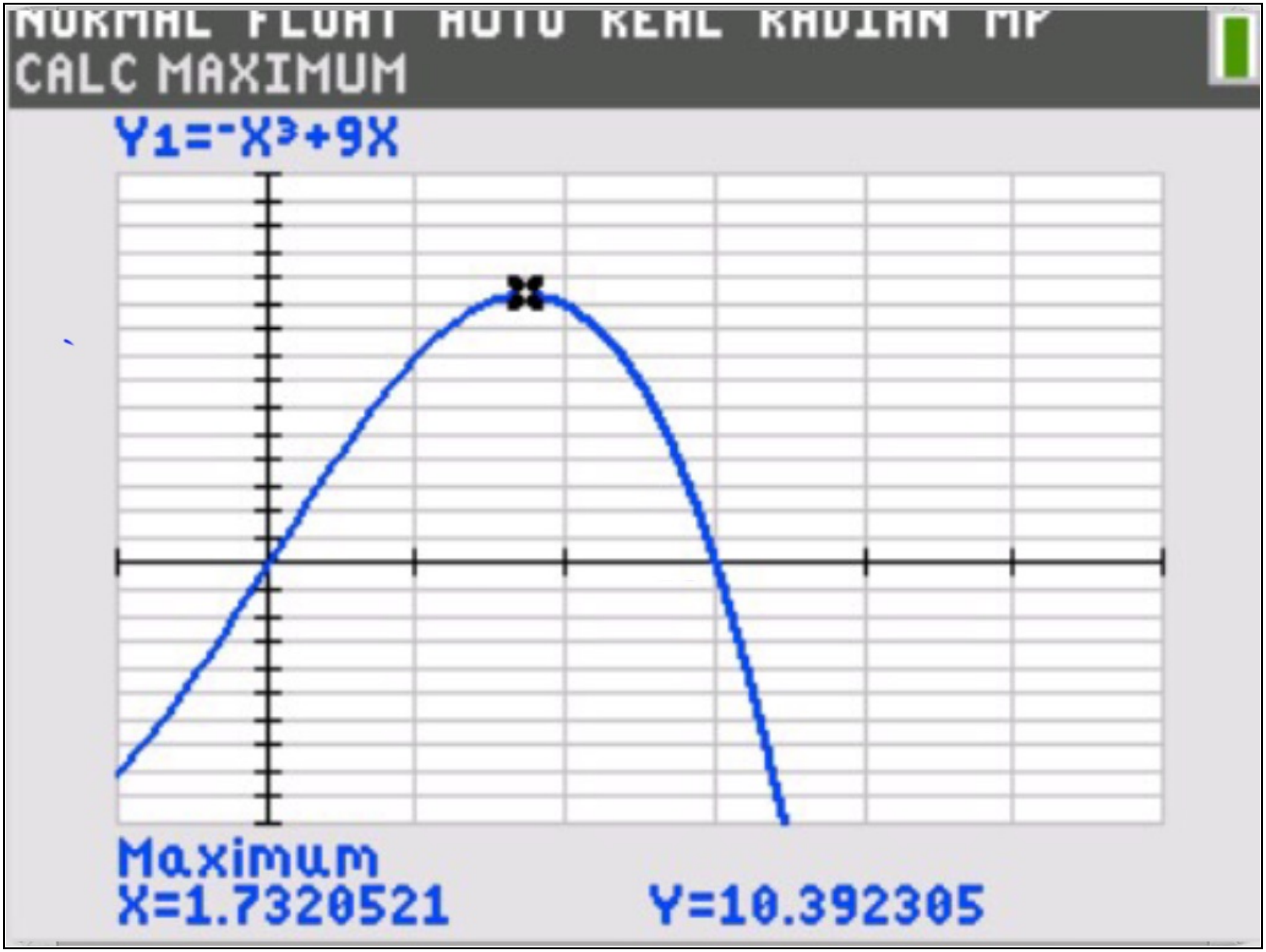
$9000 = l \cdot 120$

$l = 75$

$75 \text{ ft} \times 120 \text{ ft}$

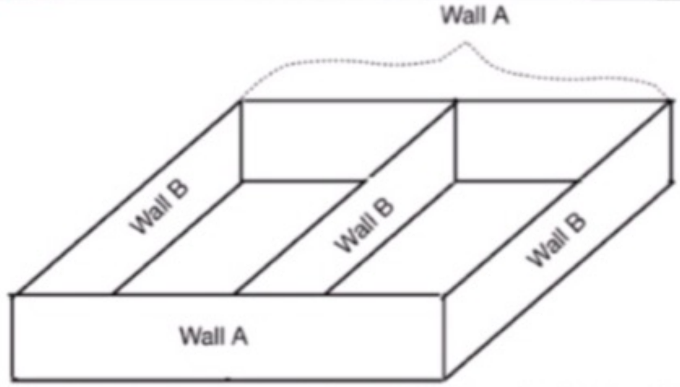



NORMAL FLOAT AUTO REAL RADIAN MP
CALC MAXIMUM
Y1=⁻2.5X²+600X
Maximum
X=120.00001
Y=36000


NORMAL FLOAT AUTO REAL RADIAN MP
CALC MAXIMUM
Y1=⁻X³+9X
Maximum
X=1.7320521
Y=10.392305

Precalc

1 of 5



You are hired to make a rectangular storage area that is a total of 5000 square feet. Walls A cost 25 dollars per linear foot and Walls B cost 30 dollar per linear foot. You are hired to minimize the cost of the storage area by some careful planning with precalculus. For argument sake, all Walls are 2-dimensional.

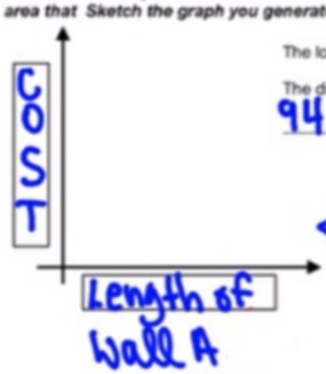
Write a function for the COST of the storage area as a function of the length of the wall A.

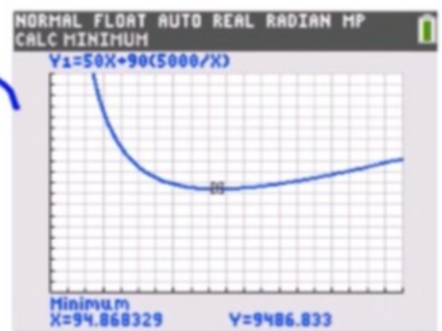
C (A) = see right

Use the function you wrote above to find the lowest cost possible. Also state the dimensions of the storage area that Sketch the graph you generated below. Label the axis accordingly.

The lowest possible cost is (to the nearest hundredth) \$9486.83

The dimensions of the total stage are (to the nearest thousandth) 94.868 ft by 52.705 ft





Area must be 5000 ft^2

So $A \cdot B = 5000$

Cost is:

$25 \cdot A$

$30 \cdot B$

Perimeter:

$P = 2A + 3B$

combine for total cost

$C = 2 \cdot 25A + 3 \cdot 30B$

Need cost with respect to length of wall A.

$C(A) = 50A + 90B$ → needs to go

$B = \frac{5000}{A}$

$C(A) = 50A + 90\left(\frac{5000}{A}\right)$

The ***POSITION*** of a moving particle on a coordinate line is given by the function,

$$s(t)=\frac{2}{3}t^3-\frac{13}{2}t^2+15t+10$$

where t is measured in minutes and s(t) is inches.

The ***VELOCITY*** of a particle is

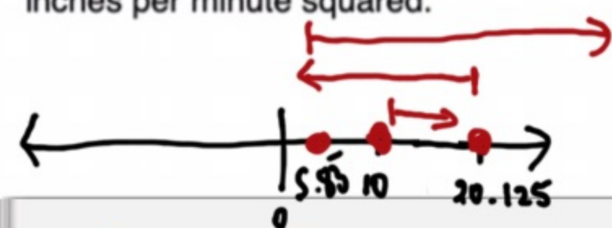
$$v(t)=2t^2-13t+15$$

where t is measured in minutes and v(t) is inches per minute.

The ***ACCELERATION*** of a particle is

$$a(t)=4x-13$$

where t is measured in minutes and a(t) is inches per minute squared.



$2t^2-13t+15=0$

$(2t-3)(t-5)=0$

$t=3/2 \quad t=5$

Answer the following questions about a particle that moves on a horizontal coordinate line.

1. Where does the particle start?
   $S(0)=10$ at 10
2. When is does the particle stop?
   $V(t)=0$ after 1.5 and 5 mins
3. Where does the particle stop?
   $S(1.5)=20.125 \quad S(5)=5.8\overline{3}$
4. When is the particle moving to the right/left?
   R: $(0,1.5)\cup(5,\infty)$ L: $(1.5,5)$
5. When is the particle speeding up/ slowing down?
   $\downarrow$: $(0,1.5)\cup(3.25,5)$ $\uparrow$: $(1.5,3.25)\cup(5,\infty)$