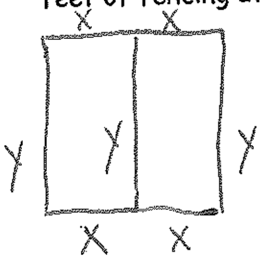
Calculus 1

Worksheet: Optimization (A) hmwk

Name____________________

Date____________________

1) You need to construct two equal sized side by side rectangular storage areas. There is a total of eighty feet of fencing available. What are the dimensions of each storage area if the area is to be maximized?



$4x+3y=80$

$4x=-3y+80$

$x=\frac{-3}{4}y+20$

$A=2x\cdot y$

$A=2\left(\frac{-3}{4}y+20\right)y$

$A=\frac{-3}{2}y^2+40y$

$A'=-3y+40=0$

$3y=40$

$y=40/3=13.334$

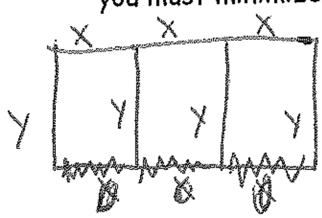
$4x+3\left(\frac{40}{3}\right)=80$

$4x=40$

$x=10$

$\boxed{10\text{ft.} \times 13.334\text{ft.}}$

2) You have to construct three side by side rectangular equal storage areas for building materials such as sand, mulch, stone, etc. One end of each bin must remain open for delivery and pick-up. The total area to be enclosed by the three areas is 2500 square feet. What are the dimensions of each storage area if you must minimize the amount of fence to be used?



$A=3xy$

$2500=3xy$

$\frac{2500}{3y}=x$

$F=3x+4y$

$F=3\left(\frac{2500}{3y}\right)+4y$

$F=2500y^{-1}+4y$

$F'=\frac{-2500}{y^2}+4$

$\frac{2500}{y^2}=4$

$2500=4y^2$

$625=y^2$

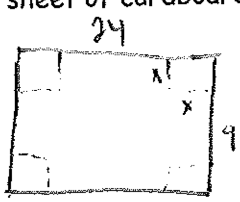
$y=25$

$2500=3\cdot x\cdot 25$

$x=33.333$

$\boxed{33.333\text{ft} \times 25\text{ft}}$

3) A cardboard box manufacturing company has to maximize the volume of a box made from a 24in by 9in sheet of cardboard. What are the dimensions of the box?



$V=(24-2x)(9-2x)\cdot x$

$V=(216-66+4x^2)x$

$V=4x^3-66x^2+216x$

$V'=12x^2-132x+216=0$

$12(x^2-11x+18)=0$

$(x-2)(x-9)=0$

$x=2,9$

$x=2 \rightarrow 20\cdot 5\cdot 2=200$

$x=9 \quad 6\cdot -9\cdot 9=$ N/A

$\boxed{20\text{in} \times 5\text{in} \times 2\text{in}}$