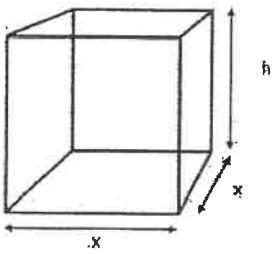
2018-19
5.4 Optimization
BC Calculus

Optimization steps:

1. Write equation for variable you want to optimize
2. Substitute to get equation in terms of one variable on one side
3. Find derivative, set derivative = 0 and solve.

1. A manufacturer wants to design an open box having a square base and a surface area of 108 in^2. What dimensions will produce a box with maximum volume?



$S = 108$

$V = x \cdot x \cdot h$

$V = x^2 h$

S = area of base + area of 4 sides

$S = x^2 + 4xh$

$108 = x^2 + 4xh$

want to max volume

$\frac{108 - x^2}{4x} = h$

$V = x^2\left(\frac{108 - x^2}{4x}\right)$

$V = \frac{1}{4}x(108 - x^2)$

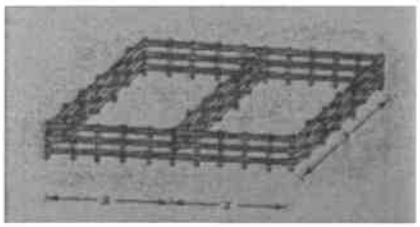
$= 27x - \frac{1}{4}x^3$

$V' = 27 - \frac{3}{4}x^2$

$0 = 27 - \frac{3}{4}x^2$

6 in = x

2. A rancher has 200 feet of fencing with which to enclose two adjacent rectangular corrals. Which dimensions should be used so that the enclosed area will be a maximum?



$A = 2xy$

$P = 4x + 3y$

$200 = 4x + 3y$

$\frac{200 - 3y}{4} = x$

$50 - 3/4\,y = x$

$A = 2(50 - 3/4\,y)y$

$A = 100y - 3/2\,y^2$

$A' = 100 - 3y$

$0 = 100 - 3y$

$100/3 = y$

$\frac{200 - 3(100/3)}{4} = x$

$\frac{200 - 100}{4} = x$

$\frac{100}{4} = x$

$25 = x$

$x = 25$ ft

$y = \frac{100}{3}$ ft