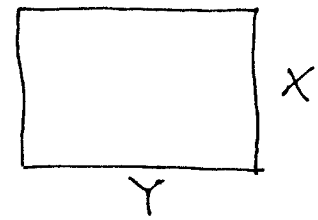
1.) (15 pts.) The area A of a rectangle is increasing at the rate of 4 ft.^{2}/sec. and its length y is decreasing at the rate of 5 ft./sec. At what rate is the rectangle's width x changing when $x = 3$ feet and $y = 6$ feet ?

Given $\frac{dA}{dt} = 4$ ft.^{2}/sec.,



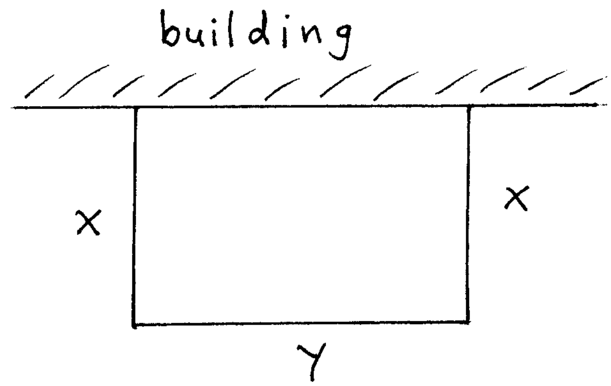
$\frac{dY}{dt} = -5$ ft./sec. ; find

$\frac{dX}{dt}$ when $X = 3$ ft., $Y = 6$ ft. :

$$A = XY \xrightarrow{D} \frac{dA}{dt} = X \cdot \frac{dY}{dt} + \frac{dX}{dt} \cdot Y \longrightarrow$$

$$4 = (3)\cdot(-5) + \frac{dX}{dt}\cdot(6) \rightarrow \frac{dX}{dt} = \frac{19}{6} \text{ ft./sec.}$$

2.) (15 pts.) A rectangular pen is formed against a building by using the building as one side of the pen and constructing the remaining three sides from 100 feet of fencing. What dimensions of the pen will result in a pen of maximum area ? List values for all variables used.



Given $2X + Y = 100 \longrightarrow$

$Y = 100 - 2X$;

maximize area

$$A = XY = X(100 - 2X) \longrightarrow \boxed{A = 100X - 2X^2}$$

$$\xrightarrow{D} A' = 100 - 4X = 0 \longrightarrow X = 25$$

$+ \quad 0 \quad -$ $\quad A'$

$X = 25$ ft.

$Y = 50$ ft and max. $A = 1250$ ft.^{2}