3.3 Maximum and Minimum Problems continued

Example: Software is sold to students for \$20 per person. At this price, it is determined that 300 students will buy it. For every \$5 increase in price, 30 less students will buy the software. What is the maximum revenue and at what price should the software be sold.

let $x = \$$ increase in ticket price

Revenue = price × # tickets

$R = (20+x)\left(300-\frac{x}{5}(30)\right)$

$R = (20+x)(300-6x)$

$R = 6000+180x-6x^2$

$R = (-6x^2+180x)+6000$

$R = -6(x^2-30x)+6000$

$R = -6(x^2-30x+225-225)+6000$

$R = -6(x-15)^2+6000-225(-6)$

$R = -6(x-15)^2+7350$

opens down
vertex $(15, 7350)$
max. rev: \$7350
ticket price \$35

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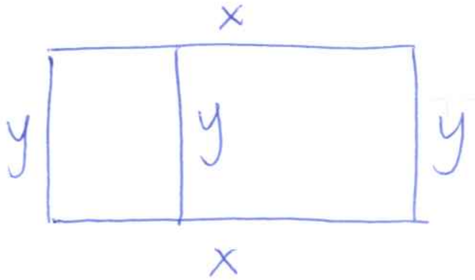
Example: A rectangular area is enclosed by a fence and divided by another section of fence parallel to two of its sides. The 300m of fence is used to enclose a maximum area. Determine the area of the enclosure.



$A = xy$ and $2x + 3y = 300$

$3y = -2x + 300$

$y = -\frac{2}{3}x + 100$

$A = x\left(-\frac{2}{3}x + 100\right)$

$A = -\frac{2}{3}x^2 + 100x$

$A = -\frac{2}{3}(x^2 - 150x)$ $\quad \left[\frac{1}{2}(150)\right]^2 = (75)^2$

$A = -\frac{2}{3}(x^2 - 150x + 5625 - 5625)$

$A = -\frac{2}{3}(x - 75)^2 - 5625(-2/3)$

$A = -\frac{2}{3}(x - 75)^2 + 3750$

opens down
vertex: $(75, 3750)$

Maximum area of $3750 m^2$
when $x = 75 m$. $y = -\frac{2}{3}x + 100$
$= -\frac{2}{3}(75) + 100$
$= 50$.

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