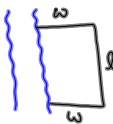


Applications of Quadratics in Factored Form Nov 4/2011

Note: All examples from lesson are included in handout.
You only need to write out solutions.

1. A rectangular lot is bounded on one side by a river and on the other three sides by 80m of fencing. Determine the dimensions of the largest lot possible.

max area



$$2w + l = 80 \quad (1)$$

$$A = l \times w \quad (2)$$

$$l = 80 - 2w \quad (3)$$

Sub (3) into $A = l \times w$
 $A = (80 - 2w)(w)$

factored form \rightarrow zeroes.
 zeroes \rightarrow axis of symmetry
 \rightarrow vertex.

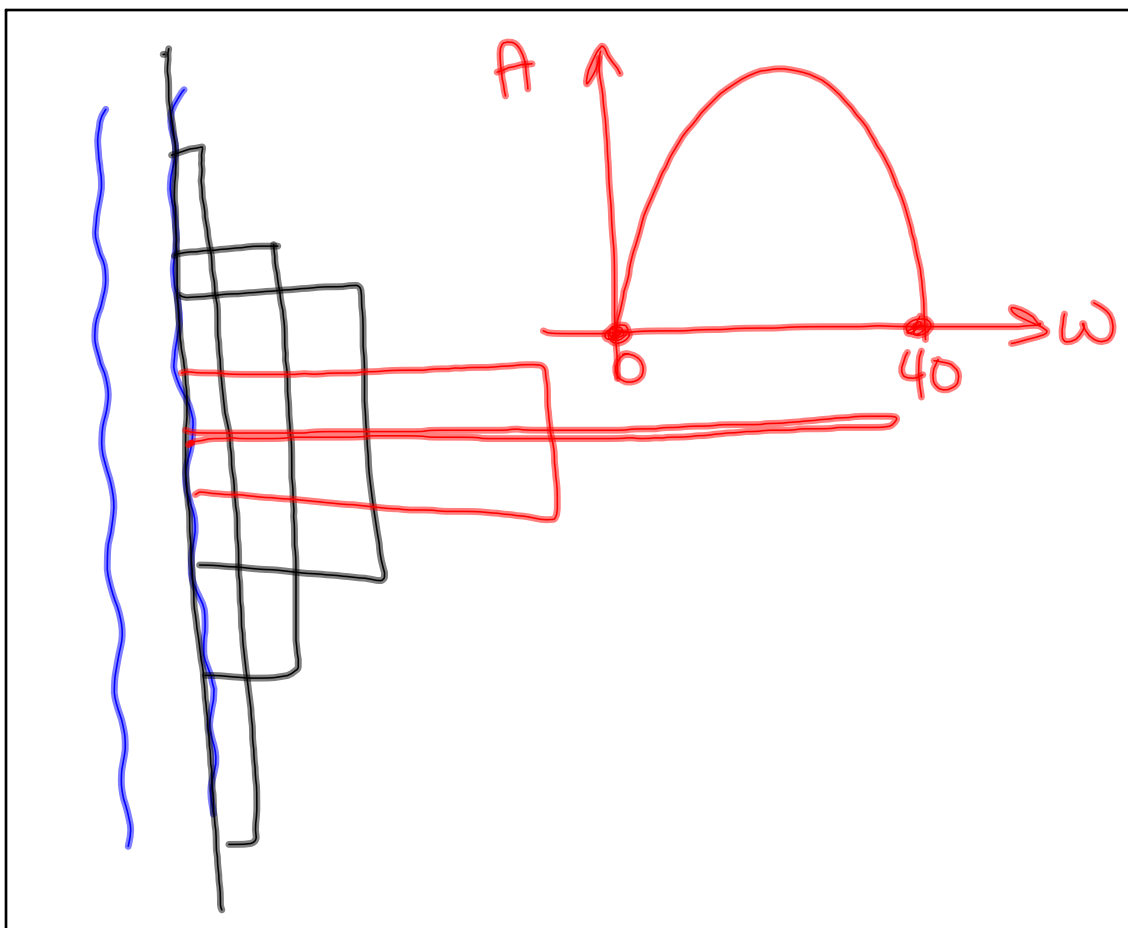
Set $A = 0$
 $0 = (80 - 2w)(w)$
 $80 - 2w = 0 \quad \text{or} \quad w = 0$
 $\frac{80}{2} = \frac{2w}{2}$
 $40 = w$

for max area, find axis of symmetry
 $w = \frac{40 + 0}{2}$
 $w = 20$

Sub $w = 20$ into (3)
 $l = 80 - 2w$
 $l = 80 - 2(20)$
 $l = 40$

\therefore dimensions for max area are 20m by 40m

Apr 19-7:41 PM



Nov 4-10:58 AM

3. The cost of a ticket to a hockey arena is \$3, and the arena holds 800 people. At this price, every ticket is sold. A survey indicates that for every dollar increase in price, attendance will fall by 100 people.

(a) What ticket price results in the greatest revenue?
 (b) What is the greatest revenue?

maximum

$$\text{Revenue} = (\# \text{ sold})(\text{price})$$

$$2400 = (800)(3)$$

$$2800 = (800 - 100)(3 + 1)$$

$$3000 = (600)(5)$$

$$R = (800 - 100x)(3 + x)$$

Set $R = 0$

$$0 = (800 - 100x)(3 + x)$$

$$800 - 100x = 0 \quad \text{or} \quad 3 + x = 0$$

$$\frac{800}{100} = \frac{100x}{100} \quad \boxed{x = -3}$$

$$\boxed{8 = x}$$

For max (vertex), find A. of S.

$$x = \frac{8 + (-3)}{2}$$

$$= \frac{5}{2}$$

$$x = 2.5 \quad \leftarrow \text{amount to add to ticket price}$$

Sub $x = 2.5$

$$R = (800 - 100x)(3 + x)$$

$$R = (800 - 100(2.5))(3 + 2.5)$$

$$R = (800 - 250)(5.5)$$

$$R = (550)(5.5)$$

$$R = 3025$$

\therefore for a maximum revenue of \$3025, sell tickets for \$5.50

Apr 20-5:50 PM

2. Supermarket cashiers try to memorize current sale prices while they work. A study showed that, on average, the percent, P , of prices memorized after t hours is given approximately by the formula

$$P = -40t^2 + 120t$$

What is the greatest percent of prices memorized, and how long does it take to memorize them?

$$P = 40t(-t + 3)$$

Apr 20-5:48 PM

4. Determine the number which exceeds the square of the same number by the greatest possible amount.

Apr 20-5:51 PM

Many word problems dealing with quadratic relations in factored form are concerned with financial situations (i.e., money). You may find the following definitions useful:

Revenue: The income for the business; the amount of money that comes into the business; positive.

Cost: The expenses for the business; the amount of money that goes out of the business; negative.

Profit: The difference between *revenue* and *cost*.

$$\text{Profit} = \text{Revenue} - \text{Cost}.$$

A positive profit is good for a business, and a negative profit (also called a *loss*) is bad.

Break-Even Point : The point where profit is zero. This is where profit changes between positive and negative.

Nov 3-11:03 PM

Assigned Work: *stevesweeney.pbworks.com*

p. 147 # 12, 13, 14

p. 157 # 13, 14, 15

Unit Test - Wednesday

Suggested Review:

- read through all notes
- revisit homework questions
 - redo questions that caused problems

p.184 # 1, 3, 5, 6, 8, 9, 10, 11ace, 12
14ace, 15ac, 16

p.240 # 2, 6, 7, 9, 10, 11, 13ace, 16ace, 17ace
19ace

p.147 #13.

$$P = 120x - 60x^2$$

profit
in thousands

| | |
|------------|--------|
| if $x = 1$ | 1000 |
| $x = 10$ | 10 000 |

factored form?

$$P = 60x(2 - x)$$

Set $P = 0$

$$0 = 60x(2 - x)$$

$$60x = 0 \text{ or } 2 - x = 0$$

$$\boxed{x = 0} \quad \boxed{2 = x}$$

$$x_v = x_{mp} = \frac{0 + 2}{2}$$

$$= 1$$

Sub $x = 1$ into $P = 60x(2 - x)$

$$= 60(1)(2 - 1)$$

$$= 60$$

\therefore max profit is \$60000

(b) $x_v = 1$
 \therefore 1000 MP3 players must be sold

(c) break-even occurs with
0 sales and 2000 sales

Nov 7-9:15 AM

14. $y = 500 - 5x^2$
 height \rightarrow time
 $(h = 500 - 5t^2)$

(a) when raft dropped, $t = 0$
 $x = 0$
 $y = 500 - 5(0)^2$
 $= 500$

(b) raft hits water when $y = 0$
 $0 = \frac{500}{5} - \frac{5x^2}{5}$
 $0 = 100 - x^2$
 $0 = (10 - x)(10 + x)$
 $10 - x = 0$ or $10 + x = 0$
 $x = 10$ or $x = -10$
 $x = -10$ is inadmissible
 "inad" but $x > 0$

\therefore hit the water after 10s.

(d) when is $y = 100$?
 $100 = 500 - 5x^2$
 $-400 = -5x^2$
 $400 = 5x^2$
 $80 = x^2$
 $x = \pm\sqrt{80}$, $x > 0$
 $x \approx 8.9$

Nov 7-9:22 AM

p. 157
15.

| | |
|-----|------|
| 700 | \$5 |
| 690 | 5.10 |
| 680 | 5.20 |

$$R = (700 - 10x)(5 + 0.10x)$$

Nov 7-9:31 AM