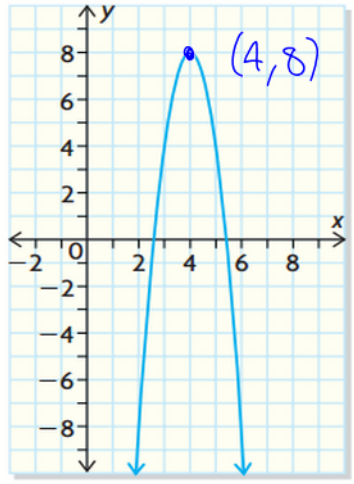
Hwk Check

#9 R2

#24

b)



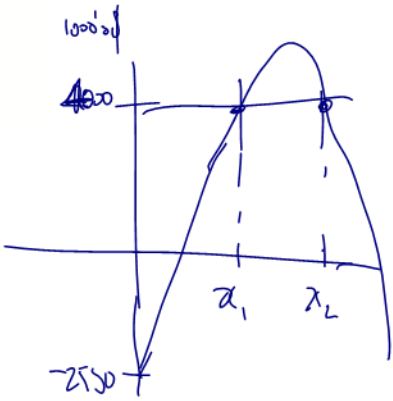
max value of 8 at $x = 4$

11. The profit $P(x)$ of a cosmetics company, in thousands of dollars, is given by **A** $P(x) = -5x^2 + 400x - 2550$, where x is the amount spent on advertising, in thousands of dollars.

a) Determine the maximum profit the company can make.

b) Determine the amount spent on advertising that will result in the maximum profit.

c) What amount must be spent on advertising to obtain a profit of at least $4 000 000?



$4000 = -5x^2 + 400x - 2550 \quad \div -5$

$-800 = x^2 - 80x + 510$

$\Rightarrow x^2 - 80x + 1310 = 0$

QF $\Rightarrow x = \dfrac{80 \pm \sqrt{(-80)^2 - 4(1)(1310)}}{2(1)}$

$= \dfrac{80 \pm 34.1}{2}$

$\therefore x = \dfrac{80 + 34.1}{2}$ or $x = \dfrac{80 - 34.1}{2}$

$= 57.05$ $= 22.55$

$\sim \$57,000$ $\sim \$22,000$

Chapter 3 – Quadratic Functions

3.4 – Operations with Radicals

First we need to understand that radicals (square roots, cube roots, etc) are numbers, and working with them should not induce any kind of fear in your spirit. So, FEAR NOT!

A couple of things to remember:

1) The square root of a square number is a nice integer.

e.g. $\sqrt{25} =$ 5

$\sqrt{49} =$ 7

2) The cube root of a cubed number is a nice integer

$3^3 = 27$

e.g. $\sqrt[3]{27} =$ 3

$\sqrt[3]{125} =$ 5

Now, if we don't have a radical with a perfect square (or cube as the case may be) we could use a calculator to find the root.

exact — decimal expansion

e.g. $\sqrt{24} = 4.898979485566356196394568114941 18...$

BUT the "decimal expansion" tends to be pretty nasty, and "**exact numbers**" are nicer to work with. $\sqrt{24}$ is considered "exact", but the decimal expansion isn't (because it has to be rounded).

We do need to know how to work with these radical NUMBERS. Working with radical numbers means we'll be adding/subtracting and multiplying/dividing them.
Before beginning, there is one thing to keep in mind:

Coefficients with Coefficients, Radicals with Radicals

e.g. The number $2\sqrt{5}$ has a coefficient part of 2 and a radical part of $\sqrt{5}$

Such a number (with both a coefficient and a radical part) is called a mixed radical

Example 3.4.1

Multiply the following:

a) $\sqrt{5}\times\sqrt{3}$ $= \sqrt{15}$

b) $-2\sqrt{7}\times 3\sqrt{6}$ $= -6\sqrt{42}$

c) $5\sqrt{10}\times\sqrt{5}$ $= 5\sqrt{50}$

d) $\sqrt{2}\times\sqrt{2}$ $= (\sqrt{2})^2 = 2$

$\sqrt{\text{radicand}}$

Example 3.4.2

look for factors of the radicand

Simplify the following:

a) $\sqrt{50}$ $= \sqrt{25\times 2} = \sqrt{25}\times\sqrt{2}$ $\sqrt{25+2} \neq \sqrt{25}+\sqrt{2}$

$= 5\sqrt{2}$

b) $-3\sqrt{27}$ $= -3\sqrt{9\times 3}$

$= -3(\sqrt{9})(\sqrt{3}) = -9\sqrt{3}$

-3×3

c) $2\sqrt{50}\times\left(-3\sqrt{24}\right)$

$= \left(2\sqrt{25\times 2}\right)\left(-3\sqrt{4\times 6}\right)$

$= \left(10\sqrt{2}\right)\left(-6\sqrt{6}\right)$ 2×5

$= -60\sqrt{12}$

$= -60\sqrt{4\times 3}$

$= -120\sqrt{3}$

does the radical simplify further? Yes!

same radicand

Note: ~~We can only add or subtract~~ **"like" radicals.**

e.g. $2\sqrt{3}$ and $-5\sqrt{3}$ **are like, but** $2\sqrt{5}$ and $3\sqrt{20}$ **are not (or aren't they?.....)**

Example 3.4.3

Add the following:

a) $3\sqrt{2}+7\sqrt{2}$

$= 10\sqrt{2}$

"like"

b) $5\sqrt{7}-3\sqrt{5}-7\sqrt{7}$

$= -2\sqrt{7} - 3\sqrt{5}$

$3(\sqrt{4})(\sqrt{5}) = 3(2)\sqrt{5} = 6\sqrt{5}$

c) $2\sqrt{5}-3\sqrt{20}$

$= 2\sqrt{5} - 3\sqrt{4\times5}$

$= 2\sqrt{5} - 6\sqrt{5} = -4\sqrt{5}$

d) $-3\sqrt{300}+\sqrt{243}$

$= -3\sqrt{100\times3} + \sqrt{81\times3}$

$(-3)(10)\sqrt{3}$

$= -30\sqrt{3} + 9\sqrt{3} = -21\sqrt{3}$

Example 3.4.4

Simplify:

a) $2\sqrt{3}\left(3\sqrt{2}-5\sqrt{6}\right)$ $= 6\sqrt{6} - 10\sqrt{18}$

$(-10)(\sqrt{9})(\sqrt{2}) = -10(3)(\sqrt{2})$

$= 6\sqrt{6} - 10\sqrt{9\times2} = 6\sqrt{6} - 30\sqrt{2}$

b) $\left(3\sqrt{12}-5\sqrt{2}\right)\left(2\sqrt{3}+3\sqrt{2}\right)$ $= 6\sqrt{36} + 9\sqrt{24} - 10\sqrt{6} - 15\sqrt{4}$

$9(2\sqrt{6})$

$= 6(6) + 9\sqrt{4\times6} - 10\sqrt{6} - 15(2)$

$= 36 + 18\sqrt{6} - 10\sqrt{6} - 30$

$= 6 + 8\sqrt{6}$

c) $\left(5-2\sqrt{2}\right)^2$

$= (5-2\sqrt{2})(5-2\sqrt{2}) = 25 - 10\sqrt{2} - 10\sqrt{2} + 4\sqrt{4}$

$= 25 - 20\sqrt{2} + 8 = 33 - 20\sqrt{2}.$

Class/Homework:
Pg. 167 – 168 #3 – 5abc, 6 – 7acef, 8 - 13