

## Solving Quadratic Equations in Standard Form

Apr. 1 /2011

Recall:

To solve an equation, find a value (or values) that satisfy the equation (i.e., make it true).

This value is called the solution or root of the equation.

Yesterday we solved equations that were in factored form today we will look at equations in the standard form:

$$ax^2 + bx + c = 0 \quad \text{OR} \quad y = ax^2 + bx + c$$

|                |             |                                |                |             |                                |
|----------------|-------------|--------------------------------|----------------|-------------|--------------------------------|
| quadratic term | linear term | constant term<br>(y-intercept) | quadratic term | linear term | constant term<br>(y-intercept) |
|----------------|-------------|--------------------------------|----------------|-------------|--------------------------------|

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Ex.2. Solve.

a)  $4x^2 - 5 = 0$

$$4x^2 = 5$$

$$x^2 = \frac{5}{4}$$

$$x = \pm \sqrt{\frac{5}{4}}$$

$$x \doteq \pm 1.118$$

b)  $2x^2 + 16 = 0$

$$2x^2 = -16$$

$$x^2 = -8$$

$$x = \pm \sqrt{-8}$$

*does not exist  
(DNE)*

Nov 25-1:05 PM

## Assigned Work

p. 343 # 3, 4, 5cd

On a blank piece of paper, make up the following 4 types of quad equations and solve.

- 1- Binomial equation with linear term:  $ax^2 \pm bx = 0$
- 2- Binomial equation with constant term:  $ax^2 \pm c = 0$
- 3- Equation:  $a(x - h)^2 + k = 0$
- 4- Trinomial:  $ax^2 \pm bx \pm c = 0$

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$$(c) -5x^2 + 2x + 1 = 0$$

$$\begin{aligned} 0 &= 5x^2 - 2x \\ 0 &= x(5x - 2) \\ x = 0 &\quad \text{or} \quad 5x - 2 = 0 \end{aligned}$$

$$\begin{aligned} 5x &= 2 \\ x &= \frac{2}{5} \end{aligned}$$

$$(d) x^2 - 9 = 0$$

$$\begin{aligned} x^2 - 16 &= 0 \\ (x-4)(x+4) &= 0 \\ \text{diff. of squares} & \end{aligned}$$

$$\text{or } (x-4)(x+4) = 0$$

adds to 0, multiplies to -16  
 $\rightarrow -4, 4$

$$x-4=0 \quad \text{or} \quad x+4=0$$

$$x = 4$$

$$x = -4$$

If factoring is not possible use the quadratic formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Later we will show you where this formula came from.

Note: To use the quadratic formula, the equation must be in standard form,  $ax^2 + bx + c = 0$ .

The ' $\pm$ ' symbol means there are two solutions.

$$x = \frac{-b + \sqrt{b^2 - 4ac}}{2a} \quad \text{or} \quad x = \frac{-b - \sqrt{b^2 - 4ac}}{2a}$$

Apr 1-9:06 AM

Ex.2) Solve using the quadratic formula.

a)  $x^2 - 4x - 3 = 0$

|         |          |          |
|---------|----------|----------|
| $a = 1$ | $b = -4$ | $c = -3$ |
|---------|----------|----------|

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(1)(-3)}}{2(1)}$$

$$x = \frac{4 \pm \sqrt{16 + 12}}{2}$$

$$x = \frac{4 \pm \sqrt{28}}{2}$$

$$x = \frac{4 + \sqrt{28}}{2}$$

$$\doteq \frac{4 + 5.29}{2}$$

$$x \doteq 4.645$$

$$x = \frac{4 - \sqrt{28}}{2}$$

$$b) x^2 - 4x + 5 = 0$$

$$\doteq \frac{4 - 5.29}{2}$$

$$x \doteq -0.645$$

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Assigned Work:

- p. 320 # 4ac, 8ace, 9abcd  
p. 343 # 1ad, 5af, 8ce

p 320 # 9(c)

$$\begin{aligned}x^2 + 1 &= 4 - 2x^2 \\+2x^2 - 4 &\quad -4 + 2x^2\end{aligned}$$

$$3x^2 - 3 = 0$$

$$3(x^2 - 1) = 0$$

$$3(x-1)(x+1) = 0$$

$$\begin{matrix}\downarrow \\ x-1=0 \quad x+1=0\end{matrix}$$

$$x=1 \text{ or } x=-1$$

p. 320 #4(c)

$$\begin{aligned}
 x &= -\frac{1}{2} & 2x^2 + 11x + 5 &= 0 & S & 11 \\
 \text{is this a root?} & \quad 2x^2 + x + 10x + 5 & P & 10 \\
 \text{root} & \quad x(2x+1) + 5(2x+1) & I & 1,10 \\
 \text{solution} & \quad (2x+1)(x+5) & \\
 \text{zero} & \quad 2x+1=0 \quad \text{or} \quad x+5=0 & \\
 & \quad x=-\frac{1}{2} & x=-5
 \end{aligned}$$

ORSub  $x = -\frac{1}{2}$  into LS + RS, then compare

$$\begin{aligned}
 LS &= 2x^2 + 11x + 5 & RS &= 0 \\
 &= 2\left(-\frac{1}{2}\right)^2 + 11\left(-\frac{1}{2}\right) + 5 & \\
 &= \frac{1}{2} - \frac{11}{2} + 5 & LS &= RS \\
 &= \frac{1}{2} - \frac{11}{2} + \frac{10}{2} & \therefore x = -\frac{1}{2} \text{ is} \\
 &= 0 & \text{a solution}
 \end{aligned}$$

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p 343 # 5(a)

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\begin{aligned}
 b &= 6 & a &= -1 & c &= -15
 \end{aligned}$$

$$\begin{aligned}
 x &= \frac{-(-1) \pm \sqrt{(-1)^2 - 4(6)(-15)}}{2(6)} \\
 &= \frac{1 \pm \sqrt{1 + 360}}{12} \\
 &= \frac{1 \pm \sqrt{361}}{12}
 \end{aligned}$$

$$\begin{aligned}
 x &= \frac{1 + \sqrt{361}}{12} \quad \text{or} \quad x = \frac{1 - \sqrt{361}}{12} \\
 &= \frac{1 + 19}{12} & &= \frac{1 - 19}{12} \\
 &= \frac{20}{12} & &= -\frac{18}{12} \\
 &= \frac{5}{3} & &= -\frac{3}{2}
 \end{aligned}$$

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p.393 #5(f)

$$12x^2 - 40 = 17x$$

$$-17x \quad -17x$$

$$12x^2 - 17x - 40 = 0$$

$$\downarrow \quad \downarrow \quad \downarrow$$

$$a=12 \quad b=-17 \quad c=-40$$

$$x = \frac{-(-17) \pm \sqrt{(-17)^2 - 4(12)(-40)}}{2(12)}$$

$$= \frac{17 \pm \sqrt{289 + 1920}}{24}$$

$$= \frac{17 \pm \sqrt{2209}}{24}$$

$$x = \frac{17 + \sqrt{2209}}{24} \quad x = \frac{17 - \sqrt{2209}}{24}$$

$$= \frac{17 + 47}{24} \quad = \frac{17 - 47}{24}$$

$$= \frac{64}{24} \quad = \frac{-30}{24}$$

$$= \frac{8}{3} \quad = -\frac{5}{4}$$

S - 17  
P - 480  
I

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1st step?

Common factors : CF

Simple trinomial : S

Complex trinomial : C

perfect square : P

difference of squares : D

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