7.7 Quadratic Equations

MATH 1010

A quadratic equation is usually a trinomial.
it's highest exponent is a square.

$$Ax^2 + Bx + C = 0$$

always equal to zero in standard form
A, B, C are just numbers

We solve for x to see what x makes it equal zero.

Three methods to solve quadratic equations:

I Factoring
II square root property
III quadratic formula

I Factor – Factor First

- set each factor equal to zero
- solve each small equation

ex. $(x-7)(x+3)=0$

$x-7=0$ $\quad$ $x+3=0$

$+7\ +7$ $\quad$ $-3\ -3$

$x=7$ $\quad$ $x=-3$

ex $(3x+4)(2x-3)=0$

$3x+4=0$ $\quad$ $2x-3=0$

$-4\ -4$ $\quad$ $+3\ +3$

$\frac{3x}{3}=\frac{-4}{3}$ $\quad$ $\frac{2x}{2}=\frac{3}{2}$

$x=\frac{-4}{3}$ $\quad$ $x=\frac{3}{2}$

7.7 continued

ex $x^2 - 2x - 8 = 0$ Factor First

$(x-4)(x+2) = 0$

$x - 4 = 0$ $\quad$ $x + 2 = 0$

$+4 \; +4$ $\quad$ $-2 \; -2$

$x = 4$ $\quad$ $x = -2$

ex $x^2 + 3x - 4 = 0$ Factor First

$(x+4)(x-1) = 0$

$x + 4 = 0$ $\quad$ $x - 1 = 0$

$-4 \; -4$ $\quad$ $+1 \; +1$

$x = -4$ $\quad$ $x = 1$

II Square Root property - get the square by itself
- square root last

ex $x^2 = 81$ opposite of a power is a root

$\sqrt{x^2} = \sqrt{81}$

$x = \pm 9$ power of 2 means two solutions because $(9)^2 = 81$ and $(-9)^2 = 81$

ex $\frac{2x^2}{2} = \frac{50}{2}$ solve for x^2

$x^2 = 25$

$\sqrt{x^2} = \sqrt{25}$

$x = \pm 5$

7.7 Continued

ex $(x-4)^2 = 36$ get rid of parentheses by a root

$\sqrt{(x-4)^2} = \sqrt{36}$

$x - 4 = \pm 6$

$+4 \quad +4$

$x = +6 \quad -6$

$+4 \quad +4$

$x = 10, -2$

ex $(x+3)^2 = 13$ in my math lab, you have to type both solutions

$\sqrt{(x+3)^2} = \sqrt{13}$

$x + 3 = \pm\sqrt{13}$

$-3 \quad -3$

$x = -3 \pm \sqrt{13}$

$-3+\sqrt{13}, \; -3-\sqrt{13}$

III Quadratic Formula – just plug in numbers into formula & simplify

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

All equations must be in standard Form:

$Ax^2 + Bx + C = 0$

7.7 Continued

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ex $x^2 + 9x + 20 = 0$ Label A, B, C

$A = 1$

$B = 9$ plug into Formula

$C = 20$

$$\frac{-9 \pm \sqrt{9^2 - 4 \cdot 1 \cdot 20}}{2 \cdot 1}$$ simplify root First

$$\frac{-9 \pm \sqrt{81 - 80}}{2}$$

$$\frac{-9 \pm \sqrt{1}}{2}$$

$$\frac{-9 \pm 1}{2} \nearrow \frac{-9+1}{2} = \frac{-8}{2} = -4$$

$$\frac{-9 \pm 1}{2} \searrow \frac{-9-1}{2} = \frac{-10}{2} = -5$$

7.7 Continued

ex $2x^2 - 5x = 4$ must equal zero

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

$A = 2$
$B = -5$
$C = -4$

$$\frac{-(-5) \pm \sqrt{(-5)^2 - 4 \cdot 2 \cdot -4}}{2 \cdot 2}$$

$$\frac{5 \pm \sqrt{25 + 32}}{4}$$

$$\frac{5 \pm \sqrt{57}}{4}$$

$$\frac{5+\sqrt{57}}{4}, \frac{5-\sqrt{57}}{4}$$

$$\frac{5 \pm \sqrt{56}}{4}$$

can't root all if then root part of it

$$\frac{5 \pm \sqrt{4}\sqrt{14}}{4}$$

$$\frac{5 \pm 2\sqrt{14}}{4}$$