

# BE-Alg. 2 MONDAY 11-21-11

Find the common denominator, then combine:

①  $\frac{1}{x} + \frac{1}{y} = ?$

②  $\frac{1}{x} + \frac{1}{x^2} = ?$

Tip:

Do Not use  $x^3$ !

③  $\frac{-5}{x} + \frac{2y}{4x^2} = ?$

Tip:

Do Not Use  $4x^3$ !

Ans

①  $\frac{1}{x} + \frac{1}{y} \Rightarrow \frac{\quad}{xy} + \frac{\quad}{xy} = \frac{\quad}{xy}$

MULT.  $x$  by  
what to get  $xy$ ?

MULT.  $y$

by what to get  $xy$ ?

$$\frac{1}{x} \cdot \left(\frac{y}{y}\right) + \frac{1}{y} \cdot \left(\frac{x}{x}\right) = \frac{y}{xy} + \frac{x}{xy} = \boxed{\frac{y+x}{xy}}$$

②  $\frac{1}{x} + \frac{1}{x^2} \Rightarrow \frac{\quad}{x^2} + \frac{\quad}{x^2} = \frac{\quad}{x^2}$

$$\frac{x}{x^2} + \frac{1}{x^2} = \boxed{\frac{x+1}{x^2}} \quad \text{ck } \frac{x}{x^2} + \frac{1}{x^2} \checkmark$$

③  $\frac{-5}{4x^2} \cdot \left(\frac{4x}{4x}\right) + \frac{2y}{4x^2} = \frac{-20x + 2y}{4x^2}$

# Complete the Square for $ax^2 + bx + c = 0$

## NOTES

$$ax^2 + bx + c = 0$$

STANDARD FORM, ANY QUADRATIC

$$\frac{ax^2}{a} + \frac{bx}{a} = \frac{-c}{a}$$

Move "c",  $\div$  by a

$$x^2 + \frac{b}{a}x + \text{cloud} = \frac{-c}{a} + \text{cloud}$$

$$x^2 + \frac{b}{a}x + \frac{b^2}{4a^2} = \frac{-c}{a} + \frac{b^2}{4a^2}$$

$$\left(\frac{1}{2} \cdot \frac{b}{a}\right)^2 = \left(\frac{b}{2a}\right)^2 = \frac{b^2}{4a^2}$$

Complete the Square term

$$\left(x + \frac{b}{2a}\right)^2 = \frac{-4ac}{4a^2} + \frac{b^2}{4a^2}$$

Change  $-\frac{c}{a}$  to common denominator of  $4a^2$

$$\frac{4a^2}{a} = 4a$$

$$\left(x + \frac{b}{2a}\right)^2 = \frac{b^2 - 4ac}{4a^2}$$

$$\therefore -\frac{c}{a} \cdot \frac{4a}{4a} = \frac{-4ac}{4a^2}$$

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

$$-\frac{b}{2a}$$

$$-\frac{b}{2a}$$

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

THE QUADRATIC FORMULA

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

or

$$x = \frac{-b \pm \sqrt{d}}{2a}$$

Since  $d = b^2 - 4ac$   
 $d = \text{discriminant}$

# Ch. 6-4 The Quadratic Formula (And the Discriminant)

Ex 1  
Pg 314 SOLVE — USING THE QF:

$$x^2 - 12x = 28$$

$$x^2 - 12x - 28 = 0$$

$$a = 1 \quad b^2 - 4ac$$

$$b = -12 \quad (-12)^2 - 4(1)(-28)$$

$$c = -28 \quad 144 + 112 = 256 = d$$

$$x = \frac{-b \pm \sqrt{d}}{2a} = \frac{-(-12) \pm \sqrt{256}}{2(1)}$$

$$x = \frac{12 \pm 16}{2}$$

$$x = \{14, -2\}$$

$$\underline{\text{CK}} \quad (14)^2 - 12(14) \stackrel{?}{=} 28$$

$$196 - 168 \stackrel{?}{=} 28 \checkmark$$

$$\underline{\text{CK}} \quad (-2)^2 - 12(-2) \stackrel{?}{=} 28$$

$$4 + 24 \stackrel{?}{=} 28 \checkmark$$

LOOK  
d = perfect  
square

$\Rightarrow$  factorable

$\Rightarrow$  2 rational

roots since  
 $\sqrt{\text{PDS}}$  is  
rational

$$(x-14)(x+2) = 0$$

ACT  
Nice  
To  
Know

144

169

196

225

256

289

324

361

400

WHAT ARE THE OTHER CONSEQUENCES  
 of having  $d$  under the square  
 root in the QF  $\Rightarrow x = \frac{-b \pm \sqrt{d}}{2a}$ ?

| <u>d</u>             | <u>Solution</u>      | <u>NOTES</u>                                            |
|----------------------|----------------------|---------------------------------------------------------|
| Perfect Square       | 2 rational numbers   | factorable                                              |
| 0                    | 1 rational number    | $\pm \sqrt{0} = 0$<br>$x = \frac{-b}{2a}$<br>factorable |
| Not A Perfect Square | 2 irrational numbers | (EX) $\pm \sqrt{5}$<br>$\pm \sqrt{6}$ etc.              |
| Negative             | 2 complex numbers    | (EX) $\pm 4i$<br>$\pm 3i\sqrt{6}$                       |

EX2  
Pg 314  
QF

$$x^2 + 22x + 121 = 0$$

$$a = 1$$

$$b^2 - 4ac$$

$$b = 22$$

$$(22)^2 - 4(1)(121)$$

$$c = 121$$

$$484 - 484 = \textcircled{0 = d}$$

$$x = \frac{-b \pm \sqrt{d}}{2a} = \frac{-22 \pm \sqrt{0}}{2(1)}$$

$$x = \frac{-22}{2} \Rightarrow \boxed{x = \{-11\}}$$

$$\underline{\text{CK}} \quad (-11)^2 + 22(-11) + 121 \stackrel{?}{=} 0$$

$$121 - 242 + 121 \stackrel{?}{=} 0 \quad \checkmark$$

Since  $d = 0$ , must have a Perfect Sq. Trinomial

$$\Rightarrow x^2 + 22x + 121 = 0$$

$$\begin{array}{c} \swarrow \quad \checkmark \quad \searrow \\ (x+11)^2 = 0 \end{array}$$

$$x + 11 = 0$$

$$x = -11 \quad \checkmark$$

- Keep an eye out for a GCF
- Always Put in  $ax^2 + bx + c$  form.

EX3  
pg 315

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

$$a = 2$$

$$b^2 - 4ac$$

$$b = 4$$

$$(4)^2 - 4(2)(-5)$$

$$c = -5$$

$$16 + 40 = 56 = d$$

$$\sqrt{56} = 4\sqrt{14}$$

$$x = \frac{-b \pm \sqrt{d}}{2a} = \frac{-4 \pm \sqrt{56}}{2(2)}$$

$$x = \frac{-4 \pm 2\sqrt{14}}{4}$$

1  
•  $\frac{1}{2}$   
•  $\frac{1}{2}$   
÷ All 3 terms by 2

$$x = \frac{-2 \pm \sqrt{14}}{2}$$

d was  $\oplus$  but NOT A perfect square  $\Rightarrow$  2 IRRATIONAL SOLUTIONS

CK  $\oplus$   $\frac{-2 + \sqrt{14}}{2} = -1 + \frac{\sqrt{14}}{2}$

$$\therefore 2\left(-1 + \frac{\sqrt{14}}{2}\right)^2 + 4\left(-1 + \frac{\sqrt{14}}{2}\right) - 5 \stackrel{?}{=} 0$$

$$2\left[1 - \frac{\sqrt{14}}{2} - \frac{\sqrt{14}}{2} + \frac{14}{4}\right] - 4 + \frac{4\sqrt{14}}{2} - 5 \stackrel{?}{=} 0$$

$$2\left[1 - \frac{2\sqrt{14}}{2} + \frac{7}{2}\right] - 9 + \frac{4\sqrt{14}}{2} \stackrel{?}{=} 0$$

$$2 - \frac{4\sqrt{14}}{2} + 7 - 9 + \frac{4\sqrt{14}}{2} \stackrel{?}{=} 0 \checkmark$$

EX 4  
Pg 315

$$x^2 - 4x = -13$$

$$x^2 - 4x + 13 = 0$$

$$a = 1 \quad b^2 - 4ac$$

$$b = -4 \quad (-4)^2 - 4(1)(13)$$

$$c = 13 \quad 16 - 52 = -36 = d$$

$$x = \frac{-b \pm \sqrt{d}}{2a} = \frac{4 \pm \sqrt{-36}}{2(1)}$$

$$x = \frac{4 \pm 6i}{2}$$

$$x = 2 \pm 3i$$

CK

$$(2+3i)^2 - 4(2+3i) \stackrel{?}{=} -13$$

+

$$4 + 12i + 9i^2 - 8 - 12i \stackrel{?}{=} -13$$

$$4 - 9 - 8 \stackrel{?}{=} -13 \checkmark$$

- Homework:
- ① Be able to complete the square on  $ax^2 + bx + c = 0$  to get the QF. (memorize the QF <sup>too</sup>).
  - ② Pg 318 # 14, 15, 16, 18 (for conjugates, check one of two).