Chapter 3 Solving Quadratic Equations

- *A review is a brief summary of the chapter. It is never an acceptable substitute for learning and understanding the notes, homework and assignment through the entire chapter.*

Know how to factor when a = 1, a > 1, difference of squares, and perfect squares. Always remember to factor any common factors out first.

e.g. 1

Is x + 1 a factor of $5x^2 + 9x + 4$

$(x+1)(ax+b) = 5x^2+9x+4$

$ax^2+bx+ax+b = 5x^2+9x+4$

$a = 5 \qquad b = 4$

$5x^2+4x+5x+4 = 5x^2+9x+4$

$5x^2+9x+4 = 5x^2+9x+4$

$\therefore$ $x+1$ is a factor.

e.g. 2

Factor this quadratic with a function inside of $2(x-6)^2 + 10(x-6) - 48$

Let $a = x-6$

$2a^2+10a-48$

$2(a^2+5a-24)$

Factors	add 5
-24	
$8, -3$	

$2(a+8)(a-3)$

$2((x-6)+8)((x-6)-3)$

$2(x+2)(x-9)$

Be able to determine which method(s) you could use for solving Quadratics.

Factoring: In ax^2+bx+c does $a\cdot c$ have factors that add to b.

Squaring both sides: Any time you have a square root

Square Rooting Both Sides: when there is no x term OR some binomial squared & a constant.

Completing the square: Three terms & you can't factor ← works better if b is even.

Quadratic Equation:

e.g. 3

Solve the following quadratic equations.

a) $6x^2 - 5x - 4 = 0$

-24 add -5 → -8, 3

$6x^2 - 8x + 3x - 4 = 0$

$2x(3x-4) + 1(3x-4) = 0$

$(2x+1)(3x-4) = 0$

$2x+1=0$ $\quad$ $3x-4=0$

$x = -\frac{1}{2}$ $\quad$ $x = \frac{4}{3}$

b) $10x^2 = -15x$

$10x^2 + 15x = 0$

$5x(2x+3) = 0$

$5x = 0$ $\quad$ $2x+3=0$

$x = 0$ $\quad$ $x = -\frac{3}{2}$

c) $3x^2 - 7 = 8$

$3x^2 = 15$

$x^2 = 5$

$x = \pm\sqrt{5}$

No x term √ both sides.

d) $\sqrt{6+x} + 4 = x$

√ so square both sides

$\sqrt{6+x} = x-4$

$6+x = (x-4)^2$

$6+x = x^2 - 8x + 16$

$0 = x^2 - 9x + 10$

$b^2 - 4ac$

$(-9)^2 - 4(1)(10)$

$81 - 40 = 41$ ∴ >0 2 roots

Use quadratic formula or completing the square.

e) $(x+2)^2 - 16 = 0$

Set root both sides

$(x+2)^2 = 16$

$x+2 = \pm\sqrt{16}$

$x = -2 \pm \sqrt{16}$

$x = -2 \pm 4$

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

$x = 2$ $\quad x = -6$

f) $x^2 + 4x - 3 = 0$

$x^2+4x = 3$

$x^2+4x+4 = 3+4$

$(x+2)^2 = 7$

$x+2 = \pm\sqrt{7}$

$x = -2 \pm \sqrt{7}$

g) $5x^2 - 10x + 2 = 0$

$x^2 - 2x + \frac{2}{5} = 0$

$x^2 - 2x + 1 = -\frac{2}{5} + 1$

$(x-1)^2 = \frac{3}{5}$

$x - 1 = \pm\sqrt{\frac{3}{5}}$

$x = 1 \pm \sqrt{\frac{3}{5}}$ → Rationalize denominator

$x = 1 \pm \frac{\sqrt{3}}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}}$

$x = 1 \pm \frac{\sqrt{15}}{5}$ ← Best

h) $x^2 - 2x - 7 = 0$

1) $\frac{1}{2}x^2 - \frac{5}{4}x = 3$

$\times 4$ $\left(\frac{1}{2}x^2 - \frac{5}{4}x - 3 = 0\right)$

$2x^2 - 5x - 12 = 0$

$a = 2$

$b = -5$

$c = -12$

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

$x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(2)(-12)}}{2(2)}$

$= \frac{5 \pm \sqrt{25 + 96}}{4}$

$= \frac{5 \pm \sqrt{121}}{4} = \frac{5 \pm 11}{4}$

There will be a 3 mark question asking you to derive the quadratic formula using the completing the square method.

The Discriminant

Be able to use the discriminant to determine how many solutions/roots a quadratic has. When I ask you to solve a quadratic, it is possible that there is no solution.

e.g. 4

Determine the values of k for which there are no roots. $2x^2 + 6x - k = 0$

$b^2 - 4ac < 0$

$6^2 - 4(2)(-k) < 0$

$36 + 8k < 0$

$8k < -36$

$k < \frac{-36}{8}$ OR $-4\frac{1}{2}$

Be ready to **explain** a couple of concepts such as the zero product property, how you can tell whether something is factorable, how determine how many roots(if any) a quadratic has, how to know which methods you can use to solve.....

There will be one or two questions from chapter 2.