

4.2 Quadratic Equations Notes

1. Solve by factoring:

a. $3x^2 = 16x + 12$

Prod -36
sum -16

$$(3x^2 - 16x - 12) = 0$$

$$(3x+2)(x-6) = 0$$

d. $x^2 + 9x + 18 = 0$

$$(x+6)(x+3) = 0$$

$$x = -6 \quad x = -3$$

b. $x^2 - 2x = 3$

c. $x^2 + 8x = 0$

$$x(x+8) = 0$$

$$x = 0 \quad x = -8$$

2. Quadratic Formula:

The roots of a quadratic equation of the form $Ax^2 + Bx + C = 0$ with $a \neq 0$ are given by the following formula:

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

3. Solve by using the quadratic formula.

a. $3x^2 + x - 2 = 0$

b. $2x^2 + 8x + 12 = 0$

c. $8x^2 + x + 2 = 0$

$$x = \frac{-1 \pm \sqrt{1 - [4(8)(2)]}}{16}$$

$$x = \frac{-1 \pm \sqrt{-63}}{16}$$

$$x = \frac{-1 \pm 3i\sqrt{7}}{16}$$

4. Discriminant: $D = b^2 - 4ac$

Expression under the radical in the quadratic formula: $b^2 - 4ac$. It helps to determine what kind of roots that you have.

- If $b^2 - 4ac > 0$ there are 2 solutions.
- If $b^2 - 4ac = 0$ there are 1 solution.
- If $b^2 - 4ac < 0$ there are no real solutions.

$b^2 - 4ac > 0$ perfect # 2 real rational
 $b^2 - 4ac > 0$ not perfect 2 real irrational

5. Determine the discriminant for each and describe the nature of the roots.

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

b. $4x^2 + 20x + 25 = 0$

c. $2x^2 + x + 28 = 0$

$$(x-5)(x+1)$$

$$b^2 - 4ac \quad 16 - 20 = 36$$

2 real rational

$$D = 0$$

2 real equal rational

$$1 - [4(2)(28)]$$

$$-223$$

2 imag. roots

6. Sum and Product Rule:

The sum of the roots of a quadratic are equal to $-\frac{b}{a}$.

The product of the roots of a quadratic are equal to $\frac{c}{a}$.

$$D = b^2 - 4ac$$

7. Write a quadratic equation for each set of roots given.

a. 2, 3

b. 4, 7

c. $\frac{2}{3}, -\frac{3}{5}$

d. $\frac{1}{2}, -\frac{5}{4}$

$(x-2)(x-3) = 0$
 $x^2 - 5x + 6 = 0$

$\frac{4}{+7} \quad 4 \cdot 7 = 28 = \frac{c}{a}$
 $\frac{11}{1} = -\frac{b}{a}$
 $x^2 - 11x + 28 = 0$

$(x-1/2)(x+5/4)$
 $(2x-1)(4x+5)$

$\frac{1}{2} + -\frac{5}{4} \quad -\frac{5}{4} \cdot \frac{1}{2} = -\frac{5}{8}$
 $-\frac{3}{4} = -\frac{b}{a} \quad -\frac{5}{8} = \frac{c}{a}$

8.

a. $2 \pm \sqrt{3}$

b. $-3 \pm \sqrt{7}$

c. $4 \pm 3i$

d. $5 \pm 2i\sqrt{3}$

$(2+\sqrt{3})(2-\sqrt{3})$
 $4 - 3 = 1$
 $4 = -\frac{b}{a} \quad 1 = \frac{c}{a}$

$$x^2 - 4x + 1 = 0$$

$(5+2i\sqrt{3})(5-2i\sqrt{3})$
 $25 - 4i^2 \sqrt{9}$
 $25 - -12$
 $37 = \frac{c}{a}$
 $10 = -\frac{b}{a}$

$$x^2 - 10x + 37 = 0$$

$(-3+\sqrt{7})(-3-\sqrt{7})$
 $9 - 7 = 2$
 $-6 = -\frac{b}{a} \quad 2 = \frac{c}{a}$

$$x^2 + 6x + 2 = 0$$