

# HW Day 04 Quadratics: Where are we now?

Master E

What are the methods for solving a Quadratic equation?... and WHEN should you use/apply each method?

| Methods for Solving   | WHEN to use it; What to look for...                | Example:                                   |
|-----------------------|--|--|
| Factoring             | ✓ for GCF 1st & then see if it factors             | • $x^2 = 64$                               |
| Completing the Square | if $a=1$ & $b$ is even                             | • $x^2 - 12x + 8 = 0$                      |
| Square Root           | if there is no middle term or it is in vertex form | • $2x^2 - 100 = 0$<br>• $3(x-1)^2 + 8 = 0$ |
| Quadratic Formula     | if $a > 1$ & the middle term is odd.               | $5x^2 - 3x + 2 = 0$                        |

Solve each equation by the BEST method. Write any irrational solutions in simplified radical form.

1.  $(x-5)^2 = 49$

$$x-5 = \pm 7$$

$$x = 5 \pm 7$$

$$5+7=12 \quad \{-2, 12\}$$

$$5-7=-2$$

4.  $x^2 + 3x - 10 = 0$

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

$$-5 \quad 2$$

$$\{-5, 2\}$$

7.  $12x^2 - 11x - 5 = 0$

$$x = \frac{11 \pm \sqrt{121 - 4(60)}}{24}$$

$$24$$

$$\frac{11 \pm \sqrt{361}}{24} = \frac{11+19}{24} \quad \frac{11-19}{24}$$

$$\left\{ -\frac{1}{3}, \frac{5}{4} \right\} \quad \frac{30}{24} = \frac{5}{4} \quad \frac{-8}{24} = -\frac{1}{3}$$

Find the zeros of each quadratic function.

10.  $y = x^2 - 7x + 12$

$$(x-4)(x-3) = 0$$

$$(4, 0) \text{ & } (3, 0)$$

8.  $4x^2 + 7x - 1 = 0$

$$-7 \pm \sqrt{49 - 4(-4)}$$

$$\frac{-7 \pm \sqrt{65}}{8}$$

11.  $y = x^2 + 5x - 24$

$$(x+8)(x-3) = 0$$

$$(-8, 0) \text{ & } (3, 0)$$

3.  $(x + 2/3)^2 = 16/9$

$$x + \frac{2}{3} = \pm \frac{4}{3}$$

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

$$-\frac{2}{3} - \frac{4}{3} = -\frac{6}{3} = -2$$

$$\{-2, \frac{2}{3}\}$$

6.  $2x^2 - 5x - 12 = 0$

$$2x^2 - 5x - 12 = 0 \quad \begin{array}{r} -24 \quad -5 \\ -8 \quad 3 \end{array}$$

$$(x - \frac{8}{2})(x + \frac{3}{2})$$

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

$$4, -\frac{3}{2} \quad \{-\frac{3}{2}, 4\}$$

9.  $25x^2 - 49 = 0$

$$(5x+7)(5x-7) = 0$$

$$-\frac{7}{5} \quad \frac{7}{5}$$

$$\{-\frac{7}{5}, \frac{7}{5}\}$$

12.  $y = x^2 - 7x - 8$

$$(x-8)(x+1)$$

$$8, -1$$

$$(8, 0) \text{ & } (-1, 0)$$

13.  $y = 2x^2 - 8x + 6$

$(x - \frac{6}{2})(x - \frac{2}{2})$   
 $2(x - 3)(x - 1) = 0$

$\{1, 3\}$   $(1, 0)$  &  $(3, 0)$

Write a quadratic function in general form that satisfies the given conditions.

16.  $a = 1$ ; The graph's x-intercepts are 6 & 9.

$y = (x - 6)(x - 9)$   
 $y = x^2 - 15x + 54$

14.  $y = 4x^2 + 2x - 2$

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

$(-1, 0)$  &  $(\frac{1}{2}, 0)$

15.  $y = 5x^2 + 19x + 12$

$(x + \frac{15}{5})(x + \frac{4}{5})$   
 $(x + 3)(5x + 4) = 0$

$(-3, 0)$  &  $(-\frac{4}{5}, 0)$

17.  $a = -1$ ; The graph's x-intercepts are -4 & -2.

$y = -(x + 4)(x + 2)$   
 $-(x^2 + 6x + 8)$   
 $y = -x^2 - 6x - 8$

18.  $a = 2$ ; The graph's x-intercepts are -7 & 5

$y = 2(x + 7)(x - 5)$   
 $2(x^2 + 2x - 35)$

$y = 2x^2 + 4x - 70$

19. The graph's x-intercepts are 8 & -3; The y-intercept is -12.

$y = a(x - 8)(x + 3)$   
 $-12 = a(0^2 - 8)(0 + 3)$   
 $-12 = -24a$   
 $\frac{1}{2} = a$   
 $y = \frac{1}{2}(x - 8)(x + 3)$   
 $\frac{1}{2}(x^2 - 5x - 24)$   
 $y = \frac{1}{2}x^2 - \frac{5}{2}x - 12$

20. The graph's x-intercepts are 0 & 13; The graph contains point (2, 22)

$y = a(x)(x - 13)$   
 $22 = a(2)(-11)$   
 $22 = -22a$   
 $-1 = a$   
 $y = -x(x - 13)$   
 $y = -x^2 + 13x$

21. The graph's x-intercepts are 4.8; The y-intercept is -5.76.

$y = a(x - 4.8)^2$   
 $-5.76 = a(-4.8)^2$   
 $-25 = a$   
 $y = -25(x - 4.8)^2 = -25(x^2 - 9.6x + 23.04)$   
 $y = -25x^2 + 240x - 576$

Convert each quadratic in general form,  $y = ax^2 + bx + c$ , to vertex form,  $y = a(x - h)^2 + k$  by completing the square. Then state the vertex of each. You can still use the "cheat" if you want to!

22.  $y = x^2 - 8x + 20$

$16 = x^2 - 8x + 16$   
 $4 = (x - 4)^2$   
 $y = (x - 4)^2 + 4$   
 v(4, 4)

23.  $y = 5x^2 - 30x - 8$

$y = x^2 - 6x - \frac{8}{5}$   
 $(x^2 - 6x + 9) - \frac{8}{5} - \frac{9}{5}$   
 $y = 5(x - 3)^2 - \frac{53}{5}$   
 $y = 5(x - 3)^2 - 53$   
 v(3, -53)

24.  $y = 2x^2 + 12x + 9$

$x^2 + 6x + \frac{9}{2}$   
 $x^2 + 6x + 9 + \frac{9}{2} - 9$   
 $(x + 3)^2 - \frac{9}{2}$   
 $y = 2(x + 3)^2 - 9$

25. Nora hit a softball straight up at a speed of 180 ft/s and her bat hit the ball at a height of 4 ft. above the ground. Answer the following questions using the projectile motion equation in your notes.

a. What is the equation that models the height of the ball?

$h(x) = -16x^2 + 180x + 4$

Window [-10, 20, 1, -30, 600, 1, 1]

b. What is the ball's maximum height and when does it reach that height?

510.25 ft at 5.62

(5.62, 510.25)

c. How long does it take for the ball to hit the ground?

11.27 seconds

(11.27, 0)