

# Section 5.3 Solving Quadratics by Factoring

Focus: Graph  $y = x^2 + bx + 8$

Vertex:  $x = \frac{-b}{2a} = \frac{-b}{2} = -3$        $y = (-3)^2 + b(-3) + 8$

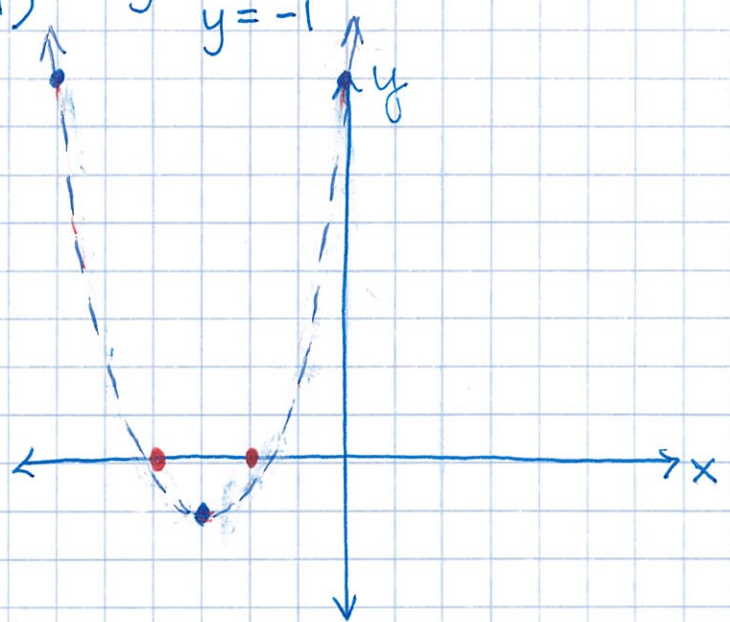
axis:  $x = -3$        $(-3, -1)$        $y = 9 - 18 + 8$   
 $y = -1$

max/min: min @  $y = -1$

D:  $(-\infty, \infty)$

R:  $[-1, \infty)$

y-int:  $(0, 8)$



X-intercepts → plug 0 in for y.  
Zeros  
roots  
solutions

$$0 = x^2 + bx + 8$$

1) Factor:  $0 = (x+2)(x+4)$

2) Zero Product Property  
If  $ab = 0$ , then  $a = 0$  or  $b = 0$ .

3) solve:  $x+2=0$        $x+4=0$   
 $x=-2$        $x=-4$   
 $(-2, 0)$        $(-4, 0)$

→ Help create a more accurate graph.

Equivalent Statements / Questions:

- 1) Find the zeros of  $y = x^2 + bx + 8$ .
- 2) Determine the x-int of  $y = x^2 + bx + 8$ .
- 3) What are the roots of  $y = x^2 + bx + 8$ ?
- 4) Solve  $x^2 + bx + 8 = 0$ .

Solve by factoring: EQ must be set EQUAL to zero!!

ex 1: Find the roots of:  $y = 3x^2 + 18x$   
 $0 = 3x^2 + 18x$   
 $0 = 3x(x+6)$   
 $3x=0 \quad x+6=0$   
 $x=0 \quad x=-6$

ex 2: solve  $4x^2 = 25$   
 $4x^2 - 25 = 0$   
 $(2x-5)(2x+5) = 0$   
 $2x-5=0 \quad 2x+5=0$   
 $2x=5 \quad 2x=-5$   
 $x = \frac{5}{2} \quad x = -\frac{5}{2}$

ex 3: Find the zeros of  $y = 18x^2 - 48x + 32$   
 $0 = 18x^2 - 48x + 32$   
 $0 = 2(9x^2 - 24x + 16)$   
 $0 = 2(3x-4)(3x-4)$   
 $0 = 2(3x-4)^2$   
 $3x-4=0$   
 $3x=4$   
 $x = \frac{4}{3}$

ex 4: solve  $t^2 = 3t$   
 $t^2 - 3t = 0$   
 $t(t-3) = 0$   
 $t=0 \quad t-3=0$   
 $t=3$

ex 5: Create a Quadratic w/ roots

1)  $x=4$  &  $x=-5$   
 $x-4=0 \quad x+5=0$   
 $(x-4)(x+5) = 0$   
 $x^2 - x - 20 = 0$   
 $y = x^2 - x - 20$

2)  $x = \frac{5}{2}$  &  $x = \frac{2}{3}$   
 $2x=5 \quad 3x=2$   
 $2x-5=0 \quad 3x-2=0$   
 $(2x-5)(3x-2) = 0$   
 $y = 6x^2 - 19x + 10$

## Review - Solving Quadratics by Factoring

Date \_\_\_\_\_ Period \_\_\_\_\_

Solve each equation by factoring.

1)  $x^2 - 64 = 0$

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

$$\boxed{x=8, x=-8}$$

3)  $a^2 = -3a$

$$a^2 + 3a = 0$$

$$a(a+3) = 0$$

$$\boxed{a=0, a=-3}$$

5)  $a^2 = 36$

$$a^2 - 36 = 0$$

$$(a-6)(a+6) = 0$$

$$\boxed{a=6, a=-6}$$

7)  $4r^2 + 7r = 2$

$$4r^2 + 7r - 2 = 0$$

$$(4r-1)(r+2) = 0$$

$$\boxed{r=1/4, r=-2}$$

9)  $3x^2 = -14 + 13x$

$$3x^2 - 13x + 14 = 0$$

$$(3x-7)(x-2) = 0$$

$$\boxed{x=7/3, x=2}$$

11)  $6k^2 - 14 = 17k$

$$6k^2 - 17k - 14 = 0$$

$$(2k-7)(3k+2) = 0$$

$$\boxed{k=7/2, k=-2/3}$$

13)  $49m^2 = 28m + 12$

$$49m^2 - 28m - 12 = 0$$

$$(7m-6)(7m+2) = 0$$

$$\boxed{m=6/7, m=-2/7}$$

2)  $p^2 = -64 - 16p$

$$p^2 + 16p + 64 = 0$$

$$(p+8)(p+8) = 0$$

$$(p+8)^2 = 0$$

$$\boxed{p=-8}$$

4)  $x^2 + 14x = -48$

$$x^2 + 14x + 48 = 0$$

$$(x+6)(x+8) = 0$$

$$\boxed{x=-6, x=-8}$$

6)  $2m^2 - 15m = -28$

$$2m^2 - 15m + 28 = 0$$

$$(2m-7)(m-4) = 0$$

$$\boxed{m=7/2, m=4}$$

8)  $5n^2 - 16 = -38n$

$$5n^2 + 38n - 16 = 0$$

$$(5n-2)(n+8) = 0$$

$$\boxed{n=2/5, n=-8}$$

10)  $10k^2 + 10 = 29k$

$$10k^2 - 29k + 10 = 0$$

$$(5k-2)(2k-5) = 0$$

$$\boxed{k=2/5, k=5/2}$$

12)  $3n^2 + 24 = -17n$

$$3n^2 + 17n + 24 = 0$$

$$(3n+8)(n+3) = 0$$

$$\boxed{n=-8/3, n=-3}$$

14)  $3x^2 - 11x = -6$

$$3x^2 - 11x + 6 = 0$$

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

$$\boxed{x=2/3, x=3}$$

## Creating Quadratic Functions

Directions: Develop a quadratic function with the given roots.

1. Create a quadratic function with the zeros  $x = -8$  and  $x = 8$ .

$$(x+8)(x-8) = 0 \quad x+8=0, x-8=0$$

$$x^2 - 64 = 0$$

$$f(x) = x^2 - 64$$

2. Create a quadratic with the zero  $x = 5/2$ .  $(2x-5)^2 = 0$

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

$$4x^2 - 20x + 25 = 0$$

$$f(x) = 4x^2 - 20x + 25$$

3. Create a quadratic with the zeros  $x = 0$  and  $x = -7/4$ .  $x=0, 4x+7=0$

$$x(4x+7) = 0$$

$$4x^2 + 7x = 0$$

$$f(x) = 4x^2 + 7x$$

4. Create a quadratic with the zeros  $x = -9/4$  and  $x = 11/2$ .  $4x+9=0, 2x-11=0$

$$(4x+9)(2x-11) = 0$$

$$8x^2 - 44x + 18x - 99 = 0$$

$$8x^2 - 26x - 99 = 0$$

$$f(x) = 8x^2 - 26x - 99$$

Factor:

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

$$(x^2 - 1)(x^2 + 5) = 0$$

$$(x-1)(x+1)(x^2+5) = 0$$

$$\begin{array}{ccc} \downarrow & \downarrow & \downarrow \\ x=1 & x=-1 & x^2 = -5 \end{array}$$

2)  $x^8 - 17x^4 + 16 = 0$

$$(x^4 - 16)(x^4 - 1) = 0$$

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

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

$$\begin{array}{ccc} \downarrow & \downarrow & \downarrow \quad \downarrow \\ x=2, x=-2 & & x=1 \quad x=-1 \end{array}$$