

LT 3.1-3.4 Study Guide and Intervention

Solving Quadratic Equations by Graphing

Solve Quadratic Equations

Quadratic Equation	A quadratic equation has the form $ax^2 + bx + c = 0$, where $a \neq 0$.
Roots of a Quadratic Equation	solution(s) of the equation, or the zero(s) of the related quadratic function

The zeros of a quadratic function are the x -intercepts of its graph. Therefore, finding the x -intercepts is one way of solving the related quadratic equation.

Example: Graph & Solve $x^2 + 2x - 3 = 0$ by graphing.

The x -coordinate of the vertex is $x = -\frac{b}{2a} = -\frac{2}{2(1)} = -1$

Make a table of values using x -values around -1 .

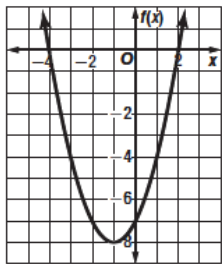
x	-3	-2	-1	0	1
f(x)	0	-3	-4	-3	0

Label the vertex, axis of symmetry, y -intercept, x -intercept and their locations. Maximum or minimum?

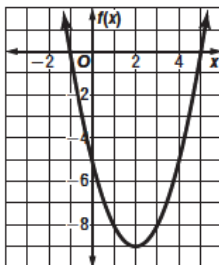
From the table and the graph, we can see that the zeros of the function are -3 and 1 . (Solutions: $x = -3$ & $x = 1$)

Graph the quadratic function. Label the vertex, axis of symmetry, y -intercept, x -intercept and their locations. Maximum or minimum? Find the solutions (zeros) of the function.

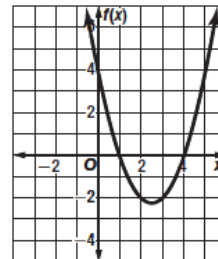
1. $x^2 + 2x - 8 = 0$
 $x = 2, -4$



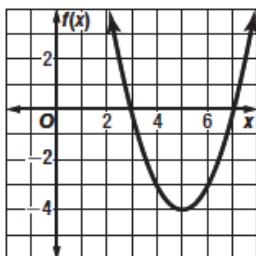
2. $x^2 - 4x - 5 = 0$
 $x = 5, -1$



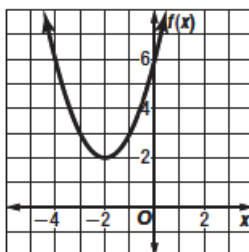
3. $x^2 - 5x + 4 = 0$
 $x = 1, 4$



4. $x^2 - 10x + 21 = 0$
 $x = 3, 7$



5. $x^2 + 4x + 6 = 0$
no solution



6. $-x^2 - 6x - 9 = 0$
 $x = -3$

LT 3.5-3.6 Study Guide for Midterm

Solving Quadratic Equations by Factoring

Factored Form To write a quadratic equation with roots p and q , let $(x - p)(x - q) = 0$. Then multiply using FOIL.

Example: Write a quadratic equation in standard form with the given roots.

a. 3, -5

$$x = 3, x = -5$$

$$(x - p)(x - q) = 0 \quad \text{Write the pattern.}$$

$$(x - 3)[x - (-5)] = 0 \quad \text{Replace } p \text{ with } 3, q \text{ with } -5.$$

$$(x - 3)(x + 5) = 0 \quad \text{Simplify.}$$

$$x^2 + 2x - 15 = 0 \quad \text{Use FOIL.}$$

The equation $x^2 + 2x - 15 = 0$ has roots 3 and -5.

b. $-\frac{7}{8}, \frac{1}{3}$

$$x = -\frac{7}{8}, x = \frac{1}{3}$$

$$(x - p)(x - q) = 0$$

$$\left[x - \left(-\frac{7}{8}\right)\right] \left(x - \frac{1}{3}\right) = 0$$

$$\left(x + \frac{7}{8}\right) \left(x - \frac{1}{3}\right) = 0$$

$$x^2 - \frac{1}{3}x + \frac{7}{8}x - \left(\frac{7}{8}\right)\left(\frac{1}{3}\right) = 0$$

$$x^2 - \frac{3}{24}x + \frac{21}{24}x - \left(\frac{7}{24}\right) = 0$$

$$x^2 + \frac{18}{24}x - \frac{7}{24} = 0$$

The equation $24x^2 + 13x - 7 = 0$ has roots $-\frac{7}{8}$ and $\frac{1}{3}$.

Write a quadratic equation in factored and standard form given the following root(s).

1. 3, -4

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

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

2. -8, -2

$$(x + 8)(x + 2) = 0$$

$$x^2 + 10x + 16 = 0$$

3. 1, 9

$$(x - 1)(x - 9) = 0$$

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

4. -5

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

$$x^2 + 10x + 25 = 0$$

5. 10, 7

$$(x - 10)(x - 7) = 0$$

$$x^2 - 17x + 70 = 0$$

6. -2, 15

$$(x + 2)(x - 15) = 0$$

$$x^2 - 13x - 30 = 0$$

7. $-\frac{1}{3}, 5$

$$\left(x + \frac{1}{3}\right)(x - 5) = 0$$

Or

$$(3x + 1)(x - 5) = 0$$

$$3x^2 - 14x - 5 = 0$$

8. $2, \frac{2}{3}$

$$(x - 2)\left(x - \frac{2}{3}\right) = 0$$

Or

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

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

9. $-7, \frac{3}{4}$

$$(x + 7)\left(x - \frac{3}{4}\right) = 0$$

Or

$$(x + 7)(4x - 3) = 0$$

$$4x^2 + 25x - 21 = 0$$

LT 3.5-3.6 Study Guide for Midterm

Solving Quadratic Equations by Factoring

Solve Equations by Factoring When you use factoring to solve a quadratic equation, you use the following property.

Zero Product Property	For any real numbers a and b , if $ab = 0$, then either $a = 0$ or $b = 0$, or both a and $b = 0$.
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Example: Solve each equation by factoring.

a. $3x^2 = 15x$

2 terms (both with x's)

$$3x^2 - 15x = 0$$

Subtract $15x$ from both sides.

$$3(x)(x) - 3(5)x = 0$$

Find GCF

$$3x(x - 5) = 0$$

Factor (take out) GCF

$$3x = 0 \text{ or } x - 5 = 0$$

Zero Product Property

$$x = 0 \text{ or } x = 5$$

Solve each equation.

The solution: $x = 0$ and $x = 5$

b. $4x^2 - 5x = 21$

$$4x^2 - 5x = 21$$

Original equation

$$4x^2 - 5x - 21 = 0$$

Subtract 21 from both sides.

$$(4x + 7)(x - 3) = 0$$

Factor the trinomial.

$$4x + 7 = 0 \quad \text{or} \quad x - 3 = 0$$

Zero Product Property

$$x = -\frac{7}{4} \text{ or } x = 3$$

Solve each equation.

The solution: $x = -\frac{7}{4}$ and $x = 3$

Solve each equation by factoring.

1. $6x^2 - 2x = 0$

$$x = x, 1/3$$

2. $x^2 = 7x$

$$x = 0, 7$$

3. $20x^2 = -25x$

$$x = 0, -5/4$$

7. $x^2 + x - 30 = 0$

$$x = 5, -6$$

9. $x^2 + 14x + 33 = 0$

$$x = -11, -3$$

15. $2x^2 - 250x + 5000 = 0$

$$x = 100, 25$$

8. $2x^2 - x - 3 = 0$

$$x = 3/2, -1$$

10. $4x^2 + 27x - 7 = 0$

$$x = 1/4, -7$$

11. $3x^2 + 29x - 10 = 0$

$$x = -10, 1/3$$

12. $6x^2 - 5x - 4 = 0$

$$x = -1/2, 4/3$$

13. $12x^2 - 8x + 1 = 0$

$$x = 1/6, 1/2$$

14. $5x^2 + 28x - 12 = 0$

$$x = 2/5, -6$$