Pennington & Reaves

Algebra 1B

Week 3 & 4

Notes #___

9.1-9.6
Reteach Solving Quadratic Equations

Learning Goals
- find the graph of quadratic equations
- Find the solutions to a quadratic equation by:
  - Graphing
  - Using the quadratic formula
  - Factoring

Vertex : $a(x-h)^2+k$

What is a quadratic?

standard An equation of the form

$$ax^2 + bx + c = 0,$$

where a, b and c are the leading coefficients

and $a \neq 0$

How do we know what they look like?

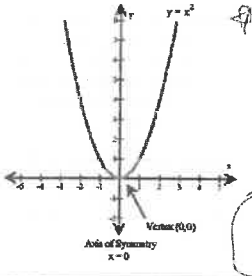
If a is positive	If a is negative
The parabola opens up	The parabola opens down

MINIMUM **MAXIMUM**

- If you graph a quadratic function, the solutions of the equation are x-values where the graph crosses the x-axis (x-intercepts).
  - These are also called solutions, zeros, and roots
- A quadratic equation can have 2, 1, or 0 real number solutions.
  - This can be determined by looking at the discriminant: $b^2 - 4ac$

Determine the vertex AND axis of symmetry

$y = x^2 + bx + c$



EQUATION FOR BOTH!!!!

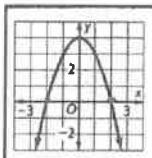
$$x = \frac{-b}{2}$$

x = "axis of symmetry"

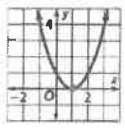
(plug x back into the equation to get the "y" in your ordered pair)

$y = x^2 + bx + c$

$\left(\frac{-b}{2}, k\right)$ = vertex



The graph crosses the x-axis where $x = -2$ and $x = 2$.
The equation $-x^2 + 4 = 0$ has 2 solutions, $-2, 2$

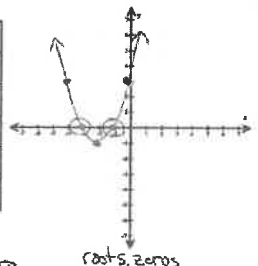


The graph touches the x-axis where $x = 1$.
The equation $x^2 - 2x + 1 = 0$ has 1 solution, 1

The graph does not touch the x-axis
The equation $x^2 - x + 2 = 0$ has No real-number solutions.

Ex 1 $y=(x+2)^2-1$

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



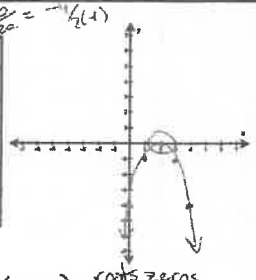
A.O.S. – $x=-2$

Vertex – $(-2,-1)$ Domain – $\mathbb{R}$ roots, zeros Solutions – $\{-3,-1\}$

Max or Min – $(-2,-1)$ Range – $[-1,\infty)$

Ex 2 $y=-x^2+4x-4$ $\frac{-b}{2a}=\frac{-4}{2(-1)}$

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



A.O.S. – $x=2$

Vertex – $(2,0)$ Domain – $(-\infty,\infty)$ roots, zeros Solutions – $\{2\}$

Max or Min – $(2,0)$ Range – $(-\infty,0]$

Ex 3 Solve $x^2-16=0$

$+16 \quad +16$

$\sqrt{x^2} = \sqrt{16}$

Two solutions

$\{\pm 4\}$

Ex 4 Solve $3x^2-75=0$

$+75 \quad +75$

$\frac{3x^2}{3} = \frac{75}{3}$

$\sqrt{x^2} = \sqrt{25}$

Two solutions $\{\pm 5\}$

Zero Product Property

If (1st factor)(2nd factor) = 0, then

1. 1st factor is 0
2. 2nd factor is 0

   or

3. 1st and 2nd factors are both 0.

Steps to Solving

1. Make the equation equal to zero
   - Get everything to one side
2. Factor the polynomial
3. Set each factor equal to zero and solve

Ex 5 Solve $8b^2-40b=0$

$8b(b-5)=0$

$8b=0 \qquad b-5=0$

$b=0 \qquad b=5$

$\{0,5\}$

Ex 6 Solve $x^2 = -10x$

$+10x \quad +10x$

$x^2 + 10x = 0$

$x(x+10) = 0$

$x = 0 \qquad x+10=0$

$x = -10$

$\{-10, 0\}$

Solve. $(3x+8)\left(\frac{3x}{3} - \frac{6}{3}\right)$

Ex 7 $3x^2 + 2x - 16 = 0$

-48: 8×-6, 2

$(3x+8)(x-2) = 0$

$3x+8=0 \qquad x-2=0$

$3x = -8 \qquad x = 2$

$x = -\frac{8}{3}$

$\left\{-\frac{8}{3}, 2\right\}$

Solve.

Ex 8 $17s + s^2 = -52$

$+52 \quad +52$

$17s + s^2 + 52 = 0$

$s^2 + 17s + 52 = 0$

$(s+13)(s+4) = 0$

52: $1 \mid 52$, $2 \mid 26$, $4 \mid 13$; 52: 4×13, 17

$(s+4)(s+13)$

$s+13=0 \qquad s+4=0$

$s = -13 \qquad s = -4$

$\{-13, -4\}$

Solve.

Ex 9 $\sqrt{(2x+1)^2} = \sqrt{9}$

$2x+1 = \pm 3$

$2x+1 = -3 \qquad 2x+1 = 3$

$2x = -4 \qquad 2x = 2$

$x = -2 \qquad x = 1$

$\{-2, 1\}$

Vocabulary

discriminant : $b^2 - 4ac$

determines the type and number of roots of a quadratic equation

Value of discriminant	# of real solutions	Type of solutions
Negative	*zero* NRS	*imaginary*
Zero		
Positive	*two*	

Steps to Solving

1. **Set equation equal to zero**
2. **Identify a, b & c**
3. **Plug in all known values in the QF**
4. **Simplify (PEMDAS)**
   & solve for the variable
5. **Check your solution(s)**

Ex 10 $15x^2 + 8x = 4$

$15x^2 + 8x - 4 = 0$

$c = -4$

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

$$x = \frac{-\ 8 \pm \sqrt{\ 8^2 - 4 \quad (-4)}}{2}$$

$$x = \frac{\pm\sqrt{\quad +240}}{} = \frac{\pm\sqrt{304}}{} = \frac{\pm 17.44}{}$$

$\{0.31, -0.85\}$ $\frac{+17.44}{} = 0.31$ $\frac{-17.44}{} = -0.85$

Reducing Radicals

$\sqrt{60} = \sqrt{4 \cdot 15}$

$\sqrt{50} - \sqrt{18} + \sqrt{2}$

$\sqrt{25 \cdot 2} - \sqrt{9 \cdot 2} + \sqrt{2}$

$5\sqrt{2} - 3\sqrt{2} + \sqrt{2}$

Rationalize

Reducing Radicals

$$\frac{1}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}}{\sqrt{4}}$$

Conjugate

$$\frac{2}{1+\sqrt{3}} \cdot \frac{1-\sqrt{3}}{1-\sqrt{3}}$$

$$\frac{2-2\sqrt{3}}{1-\sqrt{3}+\sqrt{3}-\sqrt{9}}$$

$$\frac{2-2\sqrt{3}}{1-3}$$

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

RWS 9.1-9.6

- **Write your answers in set notation**

Algebra 1 B
Solving & Graphing Quadratic Equations
Review WS

A#_____

Name _____

Date _____ Period _____

Simplify each expression.

1. $\sqrt{12}$

2. $\sqrt{48}$

3. $\sqrt{144}$

4. $2\sqrt{60}$

5. $5\sqrt{2}+3\sqrt{2}$

6. $\sqrt{12}-\sqrt{27}+4\sqrt{3}$

7. $\sqrt{50}+\sqrt{32}-\sqrt{2}$

8. $\dfrac{3}{\sqrt{2}}$

9. $\dfrac{3}{1-\sqrt{5}}$

Solve by factoring.

10. $x^2-49=0$

11. $6x^2-13x-5=0$

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

Complete the following chart.

13.

Discriminant Value	Number of Roots
positive	
	1

Find the value of the discriminant and state the number and type of roots.

14. $4x^2-20x-11=0$ **15.** $7x^2-3x=-6$ **16.** $25x^2+20x+4=0$

Solve by using the quadratic formula.

17. $5x^2=x-12$ **18.** $18x^2+23x-6=0$ **19.** $2x^2-6x+3=0$

Graph the following quadratics.

20. $y=(x-1)^2-5$

x		y	(x,y)

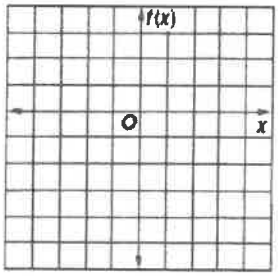
axis of symmetry _____

vertex _____

min / max (circle one)

Domain _____

Range _____



21. $y=-2x^2+8x-3$

x		y	(x,y)

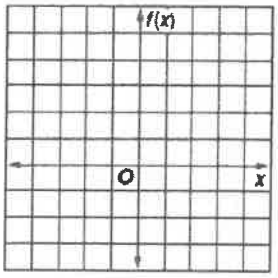
axis of symmetry _____

vertex _____

min / max (circle one)

Domain _____

Range _____



11.1 Simplifying Rational Expressions

Monomials and Binomials

Simplifying Rational Expressions

1. Factor
2. Reduce
   coefficients
3. Eliminate
   common factors
4. Determine
   restrictions

EX 1 Simplify

$\frac{21a^2}{7a^3}$

$\frac{3}{a}$ $a \neq 0$

1. Factor
2. Reduce
3. Eliminate
4. Determine
   restrictions

EX 2 Simplify

$\frac{18d^2}{4d+8}$

$\frac{18d^2}{4(d+2)}$

$\frac{9d^2}{2(d+2)}$

$\frac{9d^2}{2d+4}$ $d \neq -2$

1. Factor
2. Reduce
3. Eliminate
4. Determine
   restrictions

EX 3 Simplify

$\frac{26x^3+91x}{2x^2+7}$

$\frac{13x(2x^2+7)}{2x^2+7}$

$\frac{13x}{1}$

$13x$ *none*

1. Factor
2. Reduce
3. Eliminate
4. Determine
   restrictions

EX 4 Simplify

$\frac{2n-3}{6n-9}$

$\frac{2n-3}{3(2n-3)}$

$\frac{1}{3}$ $n \neq 3/2$

1. Factor
2. Reduce
3. Eliminate
4. Determine
   restrictions

EX 5 Simplify

$$\frac{2x-8}{x^2-2x-8}$$

$$\frac{2(x-4)}{(x-4)(x+2)}$$

$$\frac{2}{x+2} \quad x \neq -2, 4$$

EX 6 Simplify

$$\frac{2x^2+17x-9}{x^2-81}$$

$$\frac{(2x-1)(x+9)}{(x-9)(x+9)}$$

$$\frac{2x-1}{x-9} \quad x \neq -9, 9$$

EX 7 Simplify

$$\frac{64-x^2}{x^2+x-72}$$

$$\frac{(8-x)(8+x)}{(x-8)(x+9)}$$

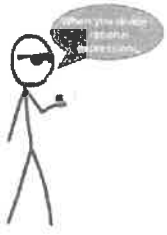
$$\frac{-1(8+x)}{x+9}$$

$$\frac{-8-x}{x+9} \quad x \neq -9, 8$$

11.2 Multiplying and Dividing Rational Expressions

Simplifying Rational Expressions

1. Multiply by the Reciprocal
2. Factor
3. Reduce coefficients
4. Eliminate common factors
5. Determine restrictions



EX 1 Simplify

$$\frac{2}{x} \cdot \frac{x^2}{4}$$

1. Factor
2. Reduce
3. Eliminate
4. Determine restrictions

$$\frac{x}{2} \quad x \neq 0$$

EX 2 Simplify

$$\frac{2-z}{4+5z}\cdot\frac{3}{z}$$

$$\frac{3(2-z)}{z(4+5z)}$$

$z \neq -4/5, 0$

1. Factor
2. Reduce
3. Eliminate
4. Determine restrictions

EX 3 Simplify

$$\frac{x^2+4x-12}{x^2+8x+16}\cdot\frac{2x+8}{x-2}$$

$$\frac{(x+6)(x-2)}{(x+4)^2}\cdot\frac{2(x+4)}{x-2}$$

$$\frac{2(x+6)}{x+4} \quad x \neq -4, 2$$

1. Factor
2. Reduce
3. Eliminate
4. Determine restrictions

EX 4 Simplify

$$\frac{8}{3x}\div\frac{2}{x^2}$$

$$\frac{8}{3x}\cdot\frac{x^2}{2}$$

$$\frac{4x}{3} \quad x \neq 0$$

1. Multiply by the Reciprocal
2. Factor
3. Reduce
4. Eliminate
5. Determine restrictions

EX 5 Simplify

$$\frac{3x+6}{18}\div\frac{4x+8}{3}$$

$$\frac{3x+6}{18}\cdot\frac{3}{4x+8}$$

$$\frac{3(x+2)}{18}\cdot\frac{3}{4(x+2)}$$

$$\frac{9}{72}=\frac{1}{8} \quad x \neq -2$$

1. Multiply by the Reciprocal
2. Factor
3. Reduce
4. Eliminate
5. Determine restrictions

EX 6 Simplify

$$\frac{x^2-1}{x^2+x-6}\div\frac{x-1}{2x+6}$$

$$\frac{x^2-1}{x^2-x+6}\cdot\frac{2x+6}{x-1}$$

$$\frac{(x-1)(x+1)}{(x+3)(x-2)}\cdot\frac{2(x+3)}{x-1}$$

$$\frac{2(x+1)}{x-2} \quad x \neq -3, 1, 2$$

1. Multiply by the Reciprocal
2. Factor
3. Reduce
4. Eliminate
5. Determine restrictions

Name _____

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Algebra 1B
RWS 11.1-11.2

Simplify each expression. State any restrictions.

1. $\frac{62}{24} \cdot \frac{46n^2}{31}$

2. $\frac{x+6}{x^2+5x-6}$

3. $\frac{10n}{9} \div \frac{13n^2}{16}$

4. $\frac{72n}{25} \cdot \frac{85}{27n^2}$

5. $\frac{16n}{17} \div \frac{8n}{6}$

6. $\frac{v^2-7v-30}{v^2-5v-24}$

7. $\frac{3}{28b} \div \frac{3}{b+1}$

8. $\frac{7n^2(n+4)}{(n-3)(n+4)} \cdot \frac{n-3}{(n+8)(n+6)}$

9. $\frac{84}{3} \cdot \frac{48x}{92}$

10. $\frac{27}{27x+18}$

11. $\frac{3}{28b} \div \frac{3}{b+1}$

12. $\frac{9(r+4)}{r+4} \cdot \frac{9r}{9(r-5)}$

13. $\dfrac{x^2-11x+18}{x^2+2x-8}$

14. $\dfrac{b^2+3b-28}{b^2-49}$

15. $\dfrac{10x^2-28x+16}{2x-4} \div \dfrac{25x^2-25x+4}{5x^2-41x+8}$

16. $\dfrac{9r^3-54r^2}{9r^2+45r} \cdot \dfrac{9r^2+9r}{9r^3-54r^2}$

17. $\dfrac{4n-4}{6n-20}$

18. $\dfrac{6p+27}{18p^2+36p} \div \dfrac{16p+72}{2p+4}$

19. $\dfrac{x^2-10x+25}{10x-100} \cdot \dfrac{x-10}{45-9x}$

20. $\dfrac{9x^2+81x}{x^3+8x^2-9x}$

21. $\dfrac{3x^2-25x-18}{27x+18} \div \dfrac{5x-3}{5x^2-33x+18}$

22. $\dfrac{m+1}{15-3m} \cdot \dfrac{8m-80}{m^2-9m-10}$

23. $\dfrac{3r^2-39r+90}{r^2-3r-70}$

24. $\dfrac{16x-56}{8} \div \dfrac{8x-28}{4}$