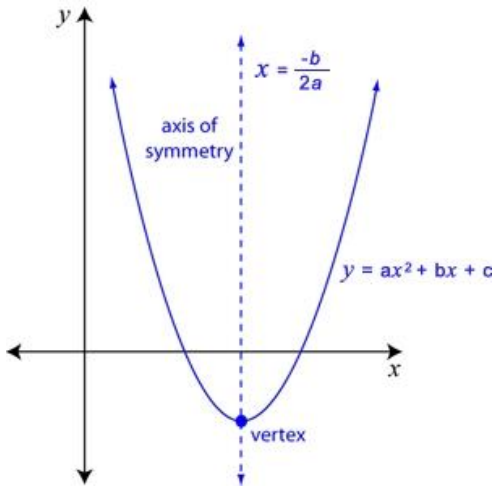
Algebra II – Chapter 4

4.1: Graph Quadratic Functions in Standard Form – 7-31 odd

Now we are going to switch from linear equations to quadratic equations. Quadratic equations are in the form: $x^2 + bx + c = y$.



Practice:

Graph the function. Compare to $y = x^2$. Label the vertex and axis of symmetry.

1) $y = 5x^2$

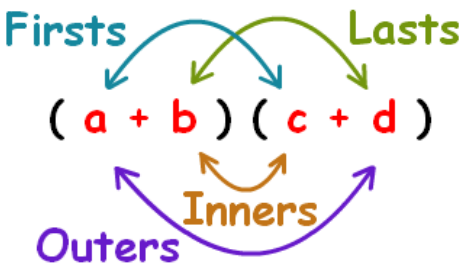
2) $y = 4x^2 + 1$

3) $y = 3x^2 - 6x + 4$

4) $f(x) = \frac{1}{2}x^2 + x - 3$

4.3: Solve $x^2 + bx + c = 0$ by Factoring – 3-37 odd

Remember FOIL and unFOIL ?

FOIL - 

unFOIL: $x^2 - 3x - 18$

- Factors of 18 are 1,3 2, 9 3,6. Which factors can I use to make 3?
- $(x - 6)(x + 3) = x^2 - 3x - 18$

Some special cases:

Difference of squares: $a^2 - b^2 = (a + b)(a - b)$

Perfect squares: $a^2 + 2ab + b^2 = (a + b)^2$

Practice:

Factor or tell if unfactorable:

1) $x^2 - 7x + 10$
2) $n^2 - 3n + 9$
3) $q^2 - 100$
4) $w^2 - 18w + 81$
5) $x^2 + 2x - 35 = 0$
6) $r^2 + 2r = 80$

4.4: Solve $ax^2 + bx + c = 0$ by Factoring – 3-39 odd

What happens if we have a number in front of the x^2term? We still factor!

Practice:

1) $3n^2 + 7n + 4$

2) $4r^2 - 25$

3) $25t^2 - 30t + 9$

One way to help is to factor the monomial 1st…

4) $12x^2 - 4x - 40$

5) $-8y^2 + 28y - 60$

We can also solve if we remember that A*B=0, either A=0 or B=0

6) Solve $14s^2 - 21s = 0$

7) Solve: $4s^2 - 20x + 25 = 0$

4.5: Solve Quadratic Equations Finding Square Roots – 3-13,23-33 odd

Do you remember square roots? Another way to solve quadratic equations is to find the square roots.

There are a few rules for square roots:

- $\sqrt{a \cdot b} = \sqrt{a} \cdot \sqrt{b}$
- $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$

Practice:

1) $\sqrt{27}$

2) $\sqrt{10} \cdot \sqrt{15}$

3) $\sqrt{\frac{15}{4}}$

Solve

4) $5x^2 = 80$

5) $z^2 - 7 = 29$

6) $3(x-2)^2 = 40$

4.6: Perform Operations with Complex Numbers – 3-27 odd

What happens when you want to take the square root of a negative number? Imaginary numbers!

$$i = \sqrt{-1} \ \ which\ means\ i^2 = -1$$

So, $\sqrt{-3} = i\sqrt{3}$

You can also have a mixture of real and imaginary numbers, called a complex number, like $3 + 8i$

Practice:

1) Solve: $x^2 + 11 = 3$

2) Solve: $5x^2 + 33 = 3$

When adding/subtracting/multiplying/dividing imaginary numbers, treat the i like a variable, but remember $i^2 = -1$

3) $(9 - i) + (-6 + 7i)$

4) $(3 + 7i) - (8 - 2i)$

5) $-4 - (1 + i) - (5 + 9i)$

6) $6i(3 + 2i)$

7) $(-1 - 5i)(-1 + 5i)$

4.7: Complete the Square – 3-33 odd

Another method to solve quadratics is to complete the square.

To complete the square for $x^2 + bx$ add $\left(\frac{b}{2}\right)^2$

Practice:

Solve by square roots:

1) $x^2 + 6x + 9 = 36$

2) $x^2 - 10x + 25 = 1$

3) $x^2 - 24x + 144 = 100$

Complete the square:

4) $x^2 + 22x + c$

Solve the equation by completing the square:

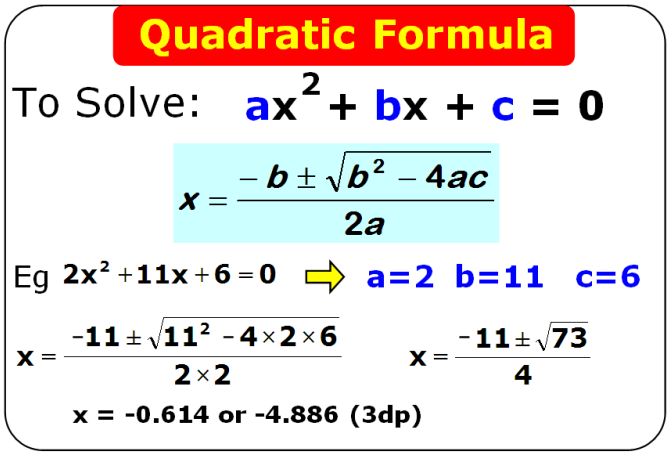
5) $x^2 + 6x + 4 = 0$

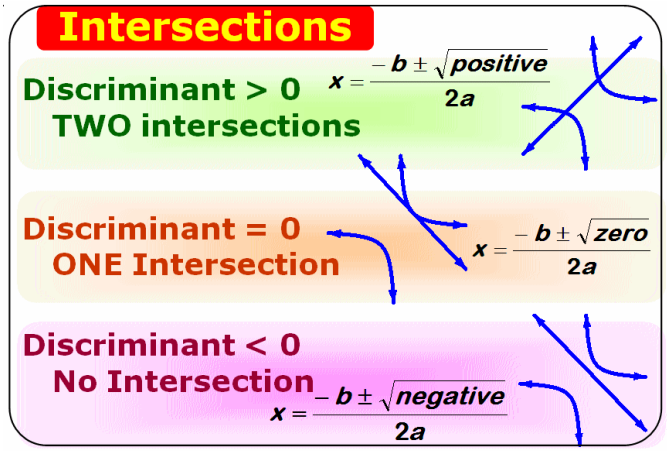
6) $3x^2 + 12x - 18 = 0$

7) $4p(p - 2) = 100$

4.8: Using the Quadratic Formula and the Discriminant – 3-47 odd

For any quadratic, you can use the quadratic formula to solve:





Practice: Use the quadratic formula to solve the equation:

1) $x^2 - 6x + 7 = 0$

2) $7x - 5 + 12x^2 = -3x$

3) Check using factoring: $z^2 + 15z + 24 = -32$

4) Find the discriminate and tell the number of solutions: $5x^2 + 16x = 11x - 3x^2$

4.9: Graph and Solve Quadratic Inequalities – 7-25, 35-43 odd

We can also graph the quadratic inequalities.

Practice: Graph!

1) $y < -x^2$

2) $y > -2x^2 + 9x - 4$

3) $y \geq 2x^2$ and $y < -x^2 + 1$

4) $y > 3x^2 + 3x - 5$ and $y < -x^2 + 5x + 10$

5) Solve by graphing: $x^2 + 8x \leq -7$

6) Solve by graphing: $-\frac{1}{2}x^2 + 4x \geq 1$