Foundations of Common Core Math 3

Unit 3 – Quadratic Modelling

Name: _____

WAKE COUNTY PUBLIC SCHOOL SYSTEM

APEX HIGH SCHOOL
1501 LAURA DUNCAN ROAD
APEX, NC 27502

Daily Plan Unit 3 – FCC3

Day	Class Lesson	Homework
Day 1: Thurs 10/2	Graphing Quadratics, vertex and standard forms, vertex axis of sym, solutions (p 1-2)	P3. 1-8 all
Day 2: Fri 10/3	Solve quad by factoring and taking sq root (p. 4-5)	P6 1-14 all
Day 3: Mon 10/6	More solve by factoring practice (p 7. Evens)	P 7. odds
Day 4: Tues 10/7	Quad applications using the calculator (p8 ex 1-6)	p.9 1-4 all, p10-11 all
Day 5: Wed 10/8	QUIZ #1 (covers days 1-4) Imag and Complex Numbers (p12)	p. 13 1-22 all
Day 6: Thurs 10/9	Solving Quad by comp the sq (p 14-15 evens)	P 14-15 odds (answers on p16)
Day 7: Fri 10/10	More comp the sq practice in groups (p17 evens)	P 17 odds
Day 8: Mon 10/13	Solve using the quad formula (p 18)	p. 19 1-10 all
Day 9: Tues 10/14	Review for quiz (p 20-21) QUIZ #2 (covers days 5-7)	
Wed 10/15	PSAT Students in class review (p 22-24)	If you miss class due to the PSAT, do p22 -24 for HW
Day 10: Thurs 10/16	Solving quad applications (no calc) p 25 1-7 all	P26-27 odds
Day 11: Fri 10/17	EARLY RELEASE P26-27 evens in groups	
Mon 10/18	PLAN Students in class begin review p. 28-31(evens)	Students who miss class for the PLAN do the evens on the review for HW p.28-31 evens
Day 12: Tues 10/19	Finish review p28-31 odds	Study for TEST
Day 13: Wed 10/20	Unit 3 TEST	

Quadratic Equations: ALL GRAPH TO BE PARABOLAS!

General Form: $f(x) = \underset{\text{quadratic}}{ax^2} + \underset{\text{linear}}{bx} + \underset{\text{constant}}{c}$ where $a \neq 0$. – allows us to solve easily for the roots

The vertex is $\left(\frac{-b}{2a}, f\left(\frac{-b}{2a}\right)\right)$ and the axis of symmetry is a vertical line $x = \frac{-b}{2a}$

Vertex Form $f(x) = a(x-h)^2 + k$ – allows us to graph easier

The vertex is (h,k) and the axis of symmetry is a vertical line x=h

Real life applications: All upward projectiles like baseballs, rockets, arrows follow a path that is shaped like an upside down parabola.

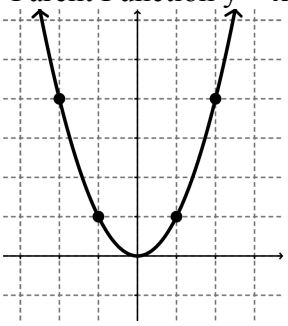
Degree (greatest exponent) = # of roots, the equation will have at most that # of solutions. **Quadratics have two solutions!**

The SOLUTION of a quadratic equation can be found by graphing, factoring, completing the square or taking square roots of both sides. Today we will focus on graphing to find solutions.

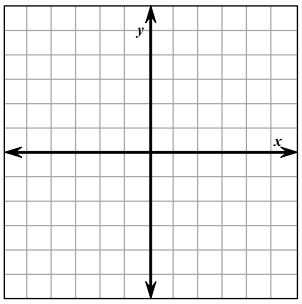
When you graph – the solutions are the x-intercepts of the parabola!

Let's Graph the Following: Remember your transformations! After plotting the vertex, remember that the NORMAL parabola goes over 1 up 1 then over 2 up 4… make sure you always show 5 points!

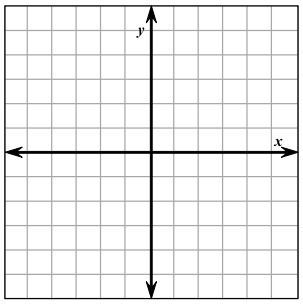
Parent Function $y = x^2$



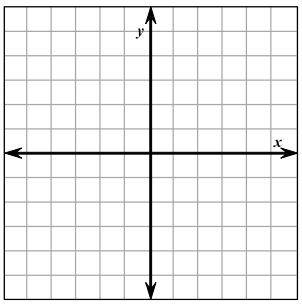
$y = (x-2)^2 + 1$



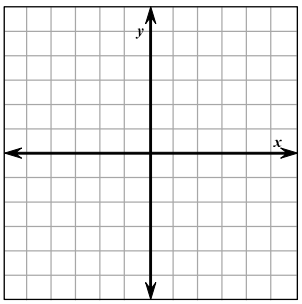
$y = (x+3)^2 - 4$



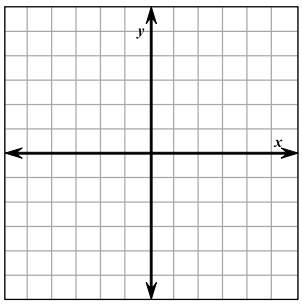
$y = -(x+1)^2 + 3$



$y = 2(x-3)^2 - 5$



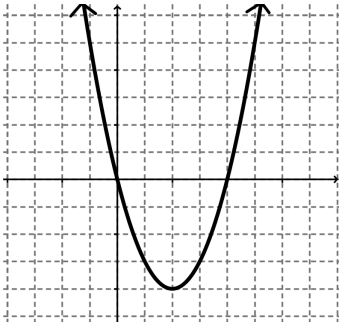
$y = \frac{1}{4}(x)^2 - 2$



Put the following in General Form $ax^2 + bx + c$. Name the vertex and axis of symmetry!

1. $f(x) = (x - 3)^2 + 4$ 2. $f(x) = (x + 1)^2 - 3$ 3. $f(x) = 2(x - 4)^2 - 3$

Solutions of quadratics are the x-intercepts—you can find them by graphing!



Name the vertex of the graph _____

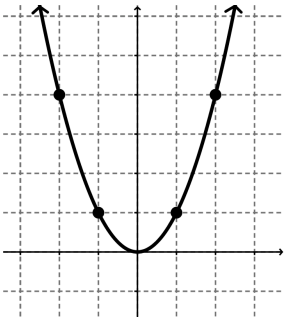
Name the axis of symmetry _____

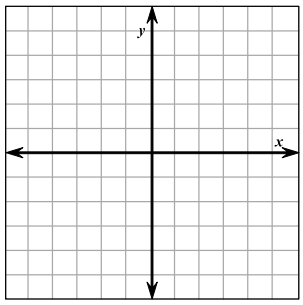
What are the x-intercepts? _____

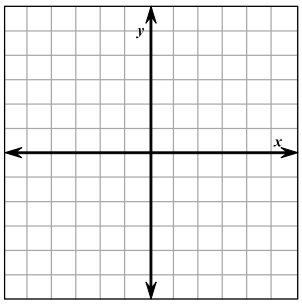
Let's try to write the equation _____

Parent Function $y = x^2$ $y = (x - 3)^2 - 1$ $y = -(x + 2)^2 + 4$

x- intercepts: _____ _____ _____

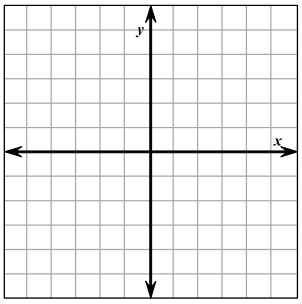


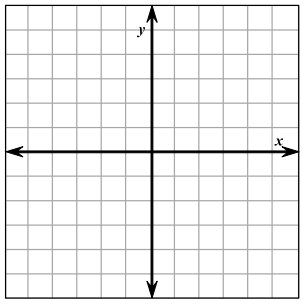


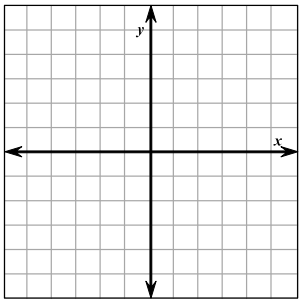


$y = -3(x + 4)^2 + 3$ $y = 2(x - 1)^2 - 2$ $y = \frac{1}{2}(x - 5)^2 - 2$

x- intercepts: _____ _____ _____







FCC3
Day 1 Homework

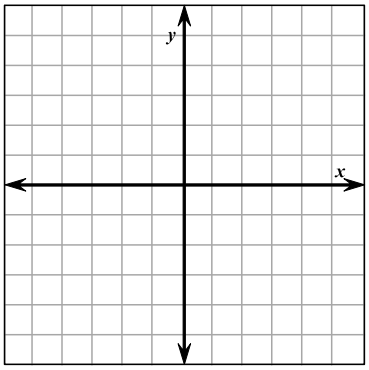
Identify the quadratic term, the linear term, and the constant term for each function.

1. $f(x) = x^2 + 14x + 49$

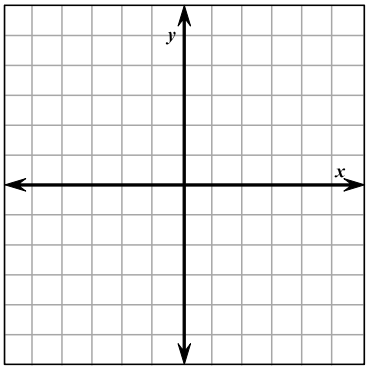
2. $f(x) = -3x^2 + x - 4$

Graph each function. Name the vertex, x intercepts and the axis of symmetry.

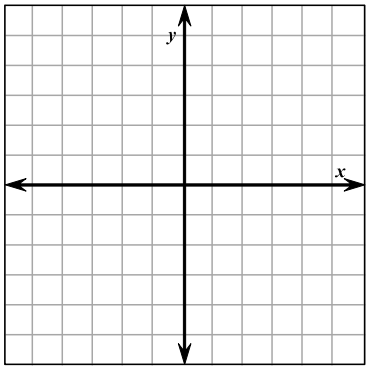
3. $f(x) = (x - 5)^2$



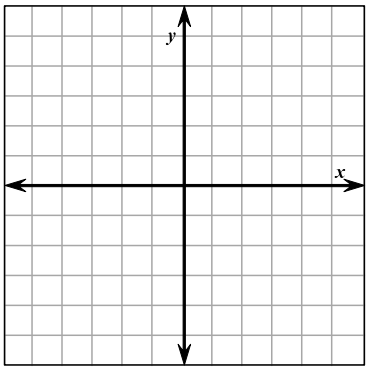
4. $f(x) = (x + 4)^2 - 6$



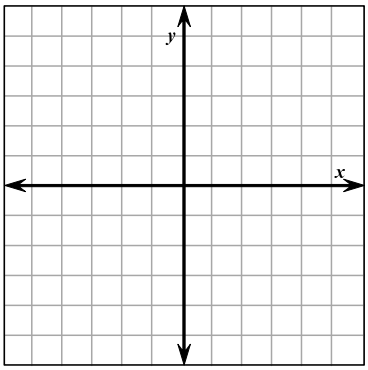
5. $f(x) = 2(x - 3)^2 - 4$



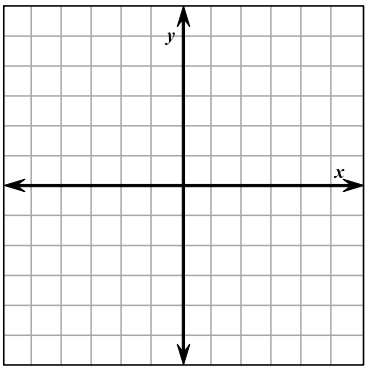
6. $f(x) = -(x + 5)^2 + 1$



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

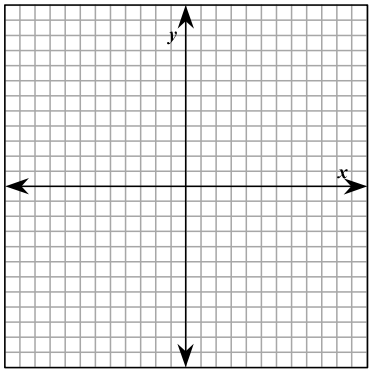


8. $f(x) = 2x^2 - 8x + 6$

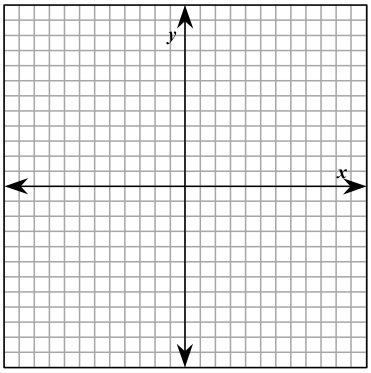


Draw the graph of each equation:

9) $f(x) = (x - 3)^2 + 2$



10) $f(x) = x^2 + 2x + 6$



Unit 3 Day 2 Notes Quadratics

Remember that you can solve a QUADRATIC by graphing, factoring, taking the square root or completing the square. Today we focus on factoring and taking the square root…..

Factoring- express a polynomial as the product of its prime factors.

FACTORING REVIEW AND PRACTICE

Method #1 --G.C.F.

1) $24a^2b - 18ab^2$ 2) $-15x^2 - 5x$ 3) $3s^2t + 4st^2 + st^3$

Method #2 --Difference of 2 squares: Can be thought of as a trinomial $ax^2 + 0x - c$

4) $x^2 - 49$ 5) $9x^2 - 25y^2$ 6) $b^4 - 64$

7) $25x^2 - 1$ 8) $a^2 + b^2$ 9) $4z^6 - 81$

REMEMBER FOIL?? $(x + 2)(x + 3) = x^2 + 5x + 6$ $(3x + 4)(x - 1) = 3x^2 + x - 4$

Try these: $(x + 1)(x + 5) =$ $(2x - 1)(x + 6) =$

Method #3 --Factoring Trinomials:

10) $x^2 - 3x - 10$ 11) $x^2 + 3x - 10$

12) $x^2 + 8x + 16$ 13) $x^2 - 5x - 84$

Method #4 –Trial and Error

14) $3z^2 + 16z - 35$ 15) $16x^2 - 24x + 9$

16) $4m^6 - 12m^3 + 9$ 17) $6n^2 - 11n - 2$

18) $2m^5 - 12m^3 + 18m$ 19) $9x^2 - 42x + 49$

20) $25y^2 - 20y + 1$ 21) $x^3 + 3x^2 - 54x$

Method #5 – Grouping

22) $b^3 - 3b^2 + 4b - 12$ 23) $x^3 + 2x^2 - x - 2$

Solve by Factoring: Make sure to 1) set the equation equal to 0
2) Factor completely
3) Set each factor equal to 0 and solve.

1) $x^2 - 2x - 15 = 0$

2) $z^2 - 5z = 0$

3) $x^2 + 6x = -9$

4) $2q^2 + 11q = 21$

5) $x^2 - 8x + 16 = 0$

6) $x^2 = 4x$

7) $x^2 + 9x = -14$

8) $3x^2 + 10x = 8$

9) $9y^2 = 49$

10) $18r^3 + 6r = 24r^2$

Solving by taking the Square Root: ONLY WORKS WHEN THE LINEAR TERM IS MISSING!

11): $x^2 - 16 = 0$

12) $x^2 = 4$

13) $2x^2 = 18$

14) $3x^2 - 48 = 0$

15) $6y^2 = 150$

16) $5x^2 = 125$

FCC3
Day 2 Homework

Solve each equation by factoring. Remember to set equal to zero. You can solve some of the following by isolating the squared term, then square rooting both sides.

1. $x^2 - 4x - 12 = 0$

2. $x^2 - 16x + 64 = 0$

3. $x^2 + 25 = 10x$

4. $9z = 10z^2$

5. $7x^2 - 4x = 0$

6. $x^2 = 2x + 99$

7. $5w^2 - 35w + 60 = 0$

8. $3x^2 + 24x + 45 = 0$

9. $15m^2 + 19m + 6 = 0$

10. $4x^2 + 6 = 11x$

11. $36x^2 = 25$

12. $12x^3 - 8x^2 = 15x$

13. $6x^3 = 5x^2 + 6x$

14. $9 = 64x^2$

FCC3—Day 3
Solving Quadratic Equations
Solve using any method.

1. $2x^2 = 16$

2. $4x^2 + 8 = 0$

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

4. $9x^2 + 15 = 0$

5. $3x^2 + 8 = 10$

6. $2y^2 + 2y - 24 = 0$

7. $b^2 - 12b = 2b - 45$

8. $x^2 = 8x + 20$

9. $25x^2 = -4$

10. $5x^2 + 6x - 12 = -4$

11. $4x^2 = 9$

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

13. $3x^2 - 7x = 6$

14. $2x^2 = 12x - 16$

15. $x^2 + 6x = 40$

16. $15x^2 = -10$

17. $x^2 - 3x + 20 = 38$

18. $15x^2 + 8 = 5$

19. $3n^2 - 6n - 45 = 0$

20. $5x^2 - 12 = 18$

21. $9x^2 - 3x = 0$

22. $3x^2 - 8x = 0$

23. $8x^2 - 12 = -15$

24. $y^2 - 7y = 30$

25. $x^2 - 7x + 10 = 0$

26. $4x^2 = 6x$

27. $3x^2 + 4x - 12 = 3$

28. $6x^2 + 17x + 5 = 0$

29. $4y^2 = -11y - 6$

30. $6x^2 = 3 - 7x$

Name _____ Number _____

Unit 3 Day 4 --- Quadratic Modeling

1.) For each equation, find the vertex, x-intercept(s), y-intercept, and sketch.

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

b. $y = 4x^2 - 4x - 2$

c. $y = -1(x + 4)^2 - 3$

d. $y = \frac{1}{2}(x-2)^2 + 1$

2.) Change $y = -2(x+3)^2 - 4$ to standard form.

3.) Major movie studios try to release "blockbuster" movies each summer. Assume that these statistics describe ticket sales for each movie:

Week 2	Week 3	Week 4
5 million tickets	7 million tickets	8 million tickets

Ticket sales can be modeled by the equation : $T = -0.5w^2 + 4.5w - 2$,
According to this model, what is the highest ticket sales that can be expected and when will it occur?

4.) A plane is dropping emergency food supplies to relieve famine in a third world country. Crates are dropped at height "h" above the ground and at time "t". The model is $h = 180 - 16t^2$.

a. Sketch the equation, and provide the realistic WINDOW you used.

b. At what time will the crate hit the ground?

c. How high is the airplane when the crate is dropped?

5.) Presidential popularity rises and falls over time. Assume that before the president signs an unpopular bill his popularity is 48%. One week later it drops to 41%; 2 weeks later it is 39%, and at 3 weeks it is 42%. The popularity can be modeled by this equation: $P = 2.5w^2 - 9.5w + 48$

a. How long will it take for his popularity to get back to what it was before he signed the bill?

b. What is the lowest it drops before beginning to rise again?

6.) Assume video sales can be modeled by $S = -4w^2 + 16w - 12$ where "S" is the amount of sales in millions of dollars and "w" is the number of weeks the videos have been sold.

a. When do we expect sales to peak?

b. According to this model, what is the most sales possible?

c. When do we expect sales to drop to nothing?

Unit 3 Day 4 Homework FCC3 Quadratics

1. Finish any of the above examples that we did not cover in class.

2. Trajectory of a Ball: The height y (in feet) of a ball thrown by a child is:

$$y = -\frac{1}{12}x^2 + 2x + 4$$

Where x is the horizontal distance (in feet) from where the ball is thrown.

Using a calculator to graph the path of a ball answer the following:

a) How high is the ball when it leaves the child's hand? (*Hint*: Find y when x = 0)

b) How high is the ball when it is at its maximum height?

c) How far from the child does the ball strike the ground?

3. Business: The profit P (in hundreds of dollars) that a company makes depends on the amount x (in hundreds of dollars) the company spends on advertising according to the model:

$$P = -0.5x^2 + 20x + 230$$

What expense for advertising results in the maximum profit?

4. Business: A textile manufacturer has a daily production costs of :

$$C = 0.45x^2 - 110x + 10{,}000$$

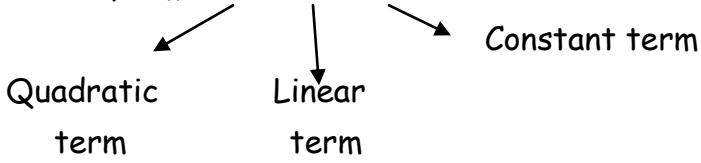
where C is the total cost (in dollars) and x is the number of units produced.

How many units should be produced each day to yield a minimum cost?

FCC3 Unit 3 --- Day 4

SUMMARY Notes: Day 1, 2 and 3: Solving Quadratic Equations

Quadratic equation in standard form : $ax^2 + bx + c$



There are 5 different methods that can be used to solve a quadratic equation:

1.) Factoring ….IF it factors (it might not!)

2.) taking the square root of both sides……..only if the quadratic equation is missing the linear term or there is a binomial being squared in the equation.

3.) graphing the parabola and finding the x intercepts

4.) completing the square

5.) quadratic formula

So far we Have practiced the first 3 methods!

Method #1: solve by factoring:

Move all terms to the left side of the equation so that it equals 0, then factor completely. Set each factor equal to zero and solve. Remember that not all quadratics can be factored…so this might not always work!

Ex. 1) $x^2 = 3x + 4$

Ex. 2) $4x^2 = 1$

Ex 3.) $3x^2 + 5x = 6$

Ex 4.) $x^3 = 2x^2$

Ex 5.) $2y^2 + 9y - 5 = 0$

Ex 6.) $9y^2 - 25 = 0$

Ex 7.) $8x^2 + 14x - 15 = 0$

Ex 8.) $y^2 + 11y + 28 = 0$

Ex 9.) $z^2 = 6z + 27$

Ex 10.) $x^2 - 81 = 0$

Method #2: Taking the square root of both sides

This method only works if the quadratic is missing the linear term or if the equation has a squared binomial in it. Remember when you take the square root of both sides you ALWAYS GET A POSITIVE AND NEGATIVE ANSWER!! This method finds both real and non-real solutions.

Ex 11.) $9x^2 = 16$

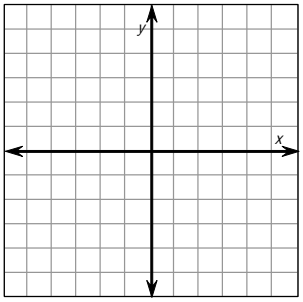
Ex 12.) $3(x-4)^2 = 75$

Ex 13.) $x^2 - 36 = 0$

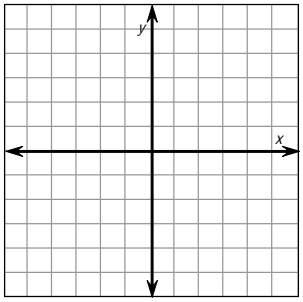
Ex 14.) $-5(y+2)^2 = 100$

Method #3: Solving by graphing

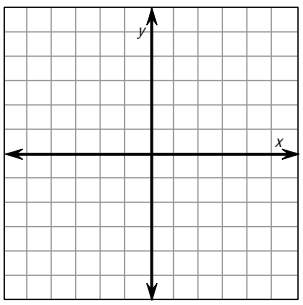
Ex 15.) $y = x^2 + 4x - 5$



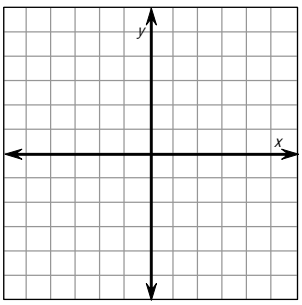
Ex 16.) $y = 2x^2 + 8x + 6$



Ex 17.) $y = -x^2 + 8x - 12$



Ex 18.) $y = x^2 - 4$



Unit 3 Day 5: Imaginary and Complex Numbers

The number " i " is an imaginary number and is defined to be $\sqrt{-1}$. So now it will be possible to solve quadratics where x^2 equals a negative value!

Solve these quadratics:

Ex. 1) $x^2 + 4 = 0$ No linear term, so we can take the square root….

$x^2 = -4$

$x = \pm\sqrt{-4} = \pm\sqrt{4} \cdot \sqrt{-1} = \pm 2i$

Ex. 2) $3x^2 + 27 = 0$

$3x^2 = -27$

$x^2 = -9$

$x = \pm\sqrt{-9} = \pm 3i$

We also need to learn how to work with "Complex Numbers", which are a combination of both real and imaginary numbers. They are always written in the form " a + bi" where "a" is the purely real part and "bi" is the imaginary part.

Adding and Subtracting: simply combine "like terms"!

Ex.3) $(2 + 3i) + (-5 - 4i) = -3 - i$ Ex.4) $(-6 - 4i) - (3+5i) = -9 - 9i$

Multiplying: simply use FOIL and remember that $i^2 = -1$

Ex 5.) $(-3 + 4i)(2+3i) = -6 - 9i + 8i + 12i^2 = -6 - i + 12(-1) = -18 - i$

Ex 6.) $(3+2i)(-5 + 4i) = -12 + 18i - 10i + 8i^2 = -12 + 8i + 8(-1) = -20 + 8i$

Review of Simplifying Radicals

Ex: $\sqrt{121} = 11$ Ex. $-\sqrt{64} = -8$ Ex. $\pm\sqrt{100} = \pm 10$

Ex. $\sqrt{-25} = 5i$ Ex. $-\sqrt{-98x} = -7i\sqrt{2x}$ Ex. $5\sqrt{20} = 10\sqrt{5}$

Ex. $-3\sqrt{72} = -18\sqrt{2}$ Ex. $10\sqrt{-49} = 70i$ Ex. $-3\sqrt{-18} = -9i\sqrt{2}$

Unit 3 – day 5 – Complex Numbers Worksheet

Simplify.

1. $\sqrt{-49}$

2. $\sqrt{-48}$

3. $6\sqrt{-12}$

4. $\sqrt{-3} \bullet \sqrt{-12}$

5. $\sqrt{-5} \bullet \sqrt{10}$

6. $\sqrt{-72}$

7. i^{42}

8. i^{91}

9. (7 – 6i) + (9 + 11i)

10. $(5+8i)+(-13+4i)$

11. -6(2 – 8i) + 3(5 + 7i)

12. 4(7 – i) - 5(2 – 6i)

13. $(3 - 4i)^2$

14. $(5+2i)^2$

15. (6 – 4i)(6 + 4i)

16. $(8-2i)(8+2i)$

17. 5(2 + 3i) + 6(8 – 5i)

18. (4 + 3i)(2 – 5i)(4 – 3i)

Find the values of x and y for which each equation is true.

19. 3x – 5yi = 15 – 20i

20. 5x + 7yi = 6 – 2i

Solve each equation by taking the square root.

21. $n^2 + 25 = 0$

22. $(m-2)^2 + 10 = 0$

23. $6(y-3)^2 + 42 = 0$

24. $4r^2 + 64 = 0$

Name_____ Date_____ Period_____

FCC3 - - Day 6 QUADRATIC EQUATIONS - - COMPLETING THE SQUARE - - Notes Sheet

I. Solve each equation by taking the square root of both sides.

1. $x^2 = 49$ **2.** $y^2 = 6$ **3.** $(x+4)^2 = 36$ **4.** $(x-8)^2 = 16$

5. $8x^2 = 3$ **6.** $3x^2 = 11$ **7.** $4(x+7)^2 = 88$ **8.** $2(x+6)^2 = 90$

9. $(x+12)^2 - 7 = -15$ **10.** $(x-1)^2 + 2 = 18$

II. What should be added to form a perfect square trinomial?

11. $x^2 + 2x$ _____ $= (\quad)^2$ **12.** $x^2 + 16x$ _____ $= (\quad)^2$

13. $x^2 + 6x$ _____ $= (\quad)^2$ **14.** $x^2 - 8x$ _____ $= (\quad)^2$

15. $x^2 + 10x$ _____ $= (\quad)^2$ **16.** $x^2 - 12x$ _____ $= (\quad)^2$

17. $x^2 - 4x$ _____ $= (\quad)^2$ **18.** $x^2 + 8x$ _____ $= (\quad)^2$

III. DIRECTIONS FOR <u>COMPLETING THE SQUARE</u>.

1. **The coefficient of the squared term must be one. If not, divide each side of the equation by the coefficient.**
2. **Add the opposite of the constant to both sides of the equation.**
3. **Take half of the coefficient of the linear term, square it, and add it to both sides of the equation.**
4. **Factor the perfect square trinomial on the left combine the numbers on the right.**
5. **Take the square root of both sides of the equation. (REMEMBER THE $\pm$!)**

6. Solve for the variable.

Solve each equation by completing the square.

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

20. $x^2 + 2x - 5 = 0$

21. $x^2 + 6x - 3 = 0$

22. $x^2 - 24x + 80 = 0$

23. $x^2 - 4x - 21 = 0$

24. $x^2 + 20x + 51 = 0$

25. $x^2 - 7x - 8 = 0$

26. $x^2 + 11x + 28 = 0$

27. $x^2 - x - 30 = 0$

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

29. $x^2 + 15x - 34 = 0$

30. $x^2 + 7x + 3 = 0$

31. $x^2 + 5x - 1 = 0$

32. $x^2 - 7x - 2 = 0$

33. $2x^2 + 6x - 3 = 0$

34. $4x^2 - 8x - 5 = 0$

35. $2x^2 + 2x + 5 = 0$

Unit 3 Day 6:Graphing Quadratics

Write each equation in the form $f(x) = (x - h)^2 + k$. Then name the vertex and the axis of symmetry for the graph of each function.

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

2) $f(x) = x^2 + 12x + 36$

3) $f(x) = x^2 + 2$

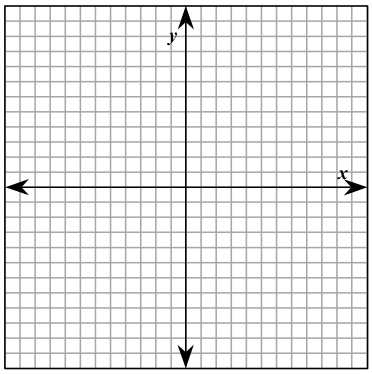
4) $f(x) = x^2 - 6x$

5) $f(x) = x^2 - 3x - 1$

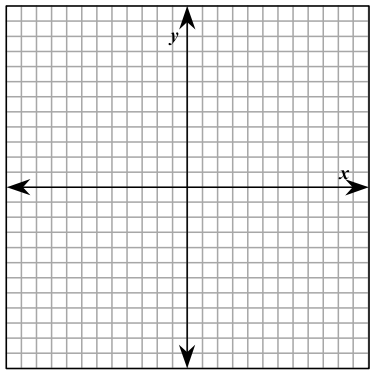
6) $f(x) = x^2 - 2x - 1$

Draw the graph of each equation:

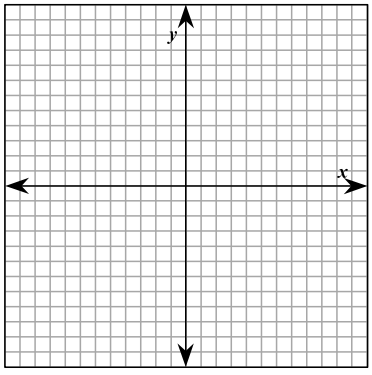
7) $f(x) = (x - 3)^2 + 2$



8) $f(x) = (x + 5)^2 - 1$



9) $f(x) = x^2 + 2x + 6$



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

FCC3 – Unit 3 – Day 7 – **More Completing the Square Practice**

SHOW EVERY STEP FOR COMPLETING THE SQUARE!

1.) $x^2 – 6x + 5 = 0$

2.) $y^2 - 8y - 9 = 0$

3.) $n^2 + 4n + 29 = 0$

4.) $x^2 – 8x + 12 = 0$

5.) $a^2 + 10a = 2$

6.) $y^2 – 6y = -13$

7.) $x^2 – 2x = -5$

8.) $w^2 + 12w – 4 = 0$

9.) $y^2 – 18y = 9$

10.) $x^2 – 10x + 9 = 0$

Unit 3 – Day 8
The Quadratic Formula

1. Quadratic Formula: $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
2. Solving using the quadratic formula:
   a. Set the equation equal to 0
   b. Identify a, b, and c
   c. Plug values into formula and simplify

3. Examples: Solve each using the quadratic formula.
   a. $3x^2 + 8x = 35$
   b. $12x - 5 = 2x^2 + 13$
   c. $x^2 = 2x - 5$
   d. $2x^2 + x = x^2 - 2x + 4$
   e. $x^2 + 64 = 16x$
   f. $-2x^2 = -2x + 3$
   g. $3p^2 - 5p + 9 = 0$
   h. $x^2 - 8x + 16 = 0$
   i. $2x^2 + x = 5$
   j. $y^2 - 16 = 0$

FCC3 Homework Day 8 Name_____

Solve each equation using the Quadratic Formula.

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

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

3. $x^2 - 10x + 30 = 0$

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

5. $4x^2 - 12x + 9 = 0$

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

7. $x^2 + 5x + 6 = 0$

8. $x^2 + 5x + 7 = 0$

9. $5x^2 - 4x = 2$

10. $-4x^2 + 20x = 25$

FCC3 2-Unit 3 Review Day 5 – 8 Name_____

1. What value would be added to both sides to complete the square for the equation $x^2 + 10x - 3 = 0$?

   A. -25 B. -5 C. 5 D. 25 1. _____

2. Simplify $(4-5i)-(2-3i)$

   A. $6-8i$ B. $2-8i$ C. $-7-22i$ D. $2-2i$ 2. _____

3. Simplify $(2-3i)(2+3i)$

   A. -5 B. $4-9i$ C. 13 D. $13-12i$ 3. _____

Solve by completing the square.

4. $x^2 + 4x - 7 = 0$ 4. _____

5. $y^2 - 8y = -20$ 5. _____

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

Solve using the Quadratic Formula. Show all work and simplify!

7. $x^2 - 36 = 0$ 7._____

8. $3x^2 = -6x + 4$ 8._____

9. $6x^2 - 5x + 4 = 0$ 9._____

Simplify these expressions completely!

10.) $(2 - 3i) - (-6 - 2i)$ 10. _____

11.) $(4 - 9i) + 3(-2 + 5i)$ 11. _____

12.) $(-2 + i)(4 - 3i)$ 12. _____

13.) $3i^2 + 2i - 5i^2 + 21i$ 13. _____

14.) $6 (2 - i) - 3(-5 + 2i)$ 14._____

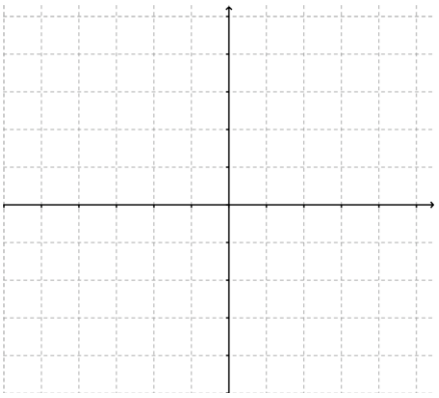
BONUS: what does $i^{12} - i^{23}$ equal??

FCC3 Review for PSAT DAY

Fill in the blanks, and graph (use vertex & 4 more points for each).

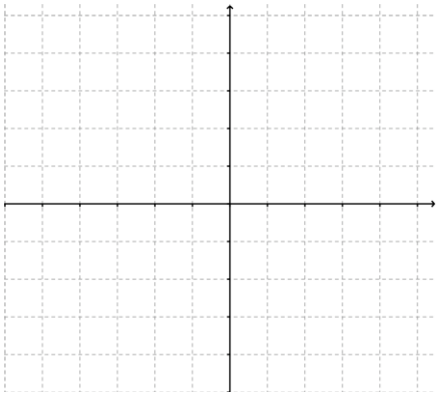
1. $y=(x-1)^2+3$

Vertex: _____
Axis of sym_____
X intercepts: _____



2. $y=2(x+1)^2-8$

Vertex: _____
Axis of sym_____
X-intercepts:_____



Multiple Choice:

3. What is the direction of opening of the parabola $f(x)=-x^2+7x-8$?

A. up B. down C. right D. left 3. _____

4. What is the equation of the graph of $y=4x^2$ shifted two units to the right?

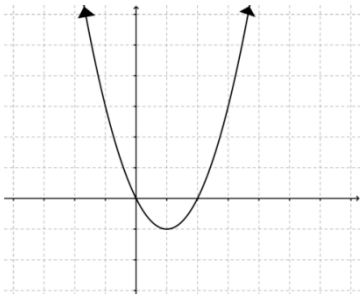
A. $y=4(x^2+2)$ B. $y=4(x+2)^2$
C. $y=4(x-2)^2$ D. $y=4x^2+2$ 4. _____

5. Write $y=(x+5)^2+1$ in standard form.

A. $y=x^2+26$ B. $y=x^2-24$
C. $y=x^2-10x-24$ D. $y=x^2+10x+26$ 5. _____

6. What is the equation of the parabola shown?

A. $y=(x-1)^2-1$
B. $y=x^2+1$
C. $y=x^2-1$
D. $y=(x+1)^2-1$



6. _____

7. A ball is thrown upward vertically with an initial speed of 48 feet per second. The equation $h = 32t - 16t^2$ gives the height of the ball where t is the number of seconds after the ball is released.

a) What is the ball's maximum height? 7a. _____

b) How long is the ball in the air? 7b. _____

. Solve each equation by factoring.

8. $x^2 - 4x - 32 = 0$

9. $4x^2 + 20x = 0$

10. $d^2 - 29d = -100$

11. $18x^2 + 29x + 3 = 0$

Solve each equation by completing the square.

12. $x^2 + 4 = 8x$

13. $x^2 - 5x = 8$

14. $2x^2 - 12x = 8$

15. $4x^2 - 12x = 16$

Solve each equation by **using the quadratic formula.**

16. $x^2 + 2x = 7$

17. $2x^2 - 12x + 5 = 0$

18. $2x - 5x^2 + 3 = 0$

19. $6x^2 - 3x + 2 = 0$

.

Given a = 5 - 2i and b= -4 + 3i

20. Find a+ b

21. Find a – b

22. Find the product of a and b

23. Find 2a – 3b

24. Find $a^2 - b^2$

25. Find $3i^2 + 2i^4$

Day 10 -- QUADRATIC EQUATION APPLICATIONS - - Class Examples

1. Find two consecutive positive integers whose product is 56.

2. The sum of the squares of two consecutive negative odd integers is 130. Find the integers.

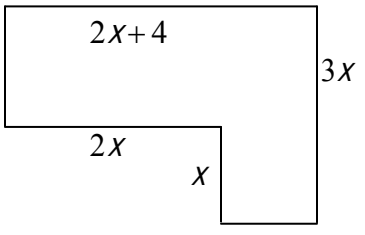
3. If the length of a rectangle is 3 *ft* greater than the width and it has an area of 28 ft^2, find the dimensions.

4. The sum of the squares of 3 consecutive integers is 77. Find the integers.

5. A farmer makes a rectangular enclosure using a stone wall for one side and 13 *ft* of fencing for the other three sides. Find the dimensions of the enclosure if the area is 15 ft^2.

6. Find the dimensions of a rectangle with an area of 24 ft^2 if its length is 2 *ft* greater than twice its width.

7. A rectangular plate has a rectangular piece cut from one corner as shown in the figure. The area after the rectangular piece is cut out is 40 square units. Use the information given in the figure to find the length and width of the original rectangular plate.



FCC3 -- Day 10: QUADRATIC EQUATIONS - - WORD PROBLEMS

1. Find three consecutive odd integers such that the product of the first and the third is 5 more than 8 times the second integer.

2. Find two numbers that have a sum of 9 and a product of 14.

3. The sail on a boat is shaped like a triangle and has an area of $68\ ft^2$. If the height of the sail is one foot longer than twice the base, find the height of the sail.

4. One side of a rectangular garden is $2\ yd$ less than the other side. If the area of the garden is $63\ yd^2$, find the dimensions of the garden.

5. A farmer makes a rectangular enclosure. He uses his barn for one side and $200\ ft$ of fencing for the other three sides. Find the dimensions of the enclosure if its area is $5000\ ft^2$.

6. A cement walk of uniform width surrounds a rectangular swimming pool that is $20\ ft$ wide and $40\ ft$ long. Find the width of the walk if its area is $396\ ft^2$.

7. Find three consecutive odd integers such that the product of the smallest and the largest is 6 more that three times the second.

8. A rectangular field is to be fenced on three sides with the fourth side bounded by the river. If the area of the field is $300 m^2$ and the total fencing used is $50 m$, what is the length of the side parallel to the river?

9. Find two consecutive integers whose product is 462.

10. The length of a rectangular pool is $4\ yd$ longer than its width. The area of the pool is $60\ yd^2$. What are the dimensions of the pool?

11. The legs of a right triangle have length of $4\ ft$ and $5\ ft$. When the legs are decreased in length by equal amounts, the area of the resulting triangle is $4\ ft^2$ less than that of the original triangle. Find the lengths of the legs of the new triangle.

12. The base of a triangle is $4\ ft$ greater that its altitude. The area of the triangle is $96\ ft^2$. Find the length of the base.

13. When a border of uniform width is added to a rectangular lot with dimensions of $30\ yd\ x\ 20\ yd$, the total area is double that of the original lot. Find the width of the border.

14. Find the negative integer whose square is 10 more than three times the integer.

15. A rectangular yard is $40\ ft\ x\ 60\ ft$. Grass is cut in a uniform strip along the edges until $\frac{2}{3}$ of the grass is cut. What is the width of the strip?

16. A rectangular field is to be fenced in on four sides, but one side has a gap of $5\ ft$ for a gate. If the area of the field is $600\ ft^2$ and the total amount of fencing used is $95\ ft$, what is the length of the side with the gate?

17. A rectangular photograph is mounted inside a rectangular poster. The area of the photograph is $600 in^2$. There are $3 in$ borders between the top of the photograph and the top of the poster and between the bottom of the photograph and the bottom of the poster. There are $2 in$ borders between the sides of the photograph and the sides of the poster. If the perimeter of the poster is $120 in$, what are the dimensions of the photograph?

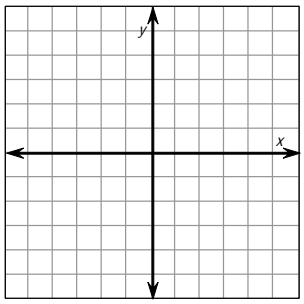
FCC3 Name_____

Unit 3 REVIEW

Graph each of the following. Use your transformations.(not your calculator!)

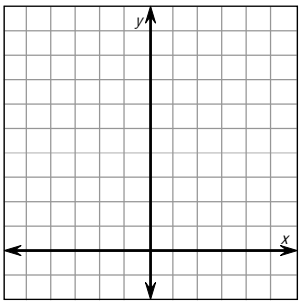
1. $y = (x + 1)^2 - 3$

vertex: _____



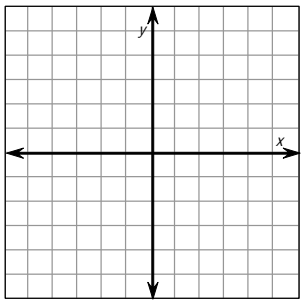
2. $y = 2(x - 3)^2 + 1$

vertex: _____



3. $y = -\frac{1}{2}(x - 2)^2 + 3$

vertex: _____



Find the vertex for each of the following.

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

vertex: _____

5. $f(x) = -3x^2 + 6x - 5$

vertex: _____

6. $f(x) = x^2 + 8x$

vertex: _____

For the multiple choice questions, write the letter for the correct answer in the blank at the right.

7. What is the equation of the axis of symmetry of $y = (x - 4)^2 + 1$?

A. $x = -1$ B. $x = 4$ C. $x = 1$ D. $x = -4$ 7._____

8. What is the direction of opening of the parabola $y = -x^2 + 7x - 8$?

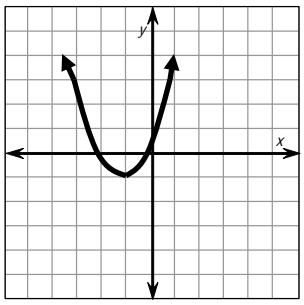
A. up B. right C. down D. left 8._____

9. Write an equation of the parabola obtained by shifting the graph of $y = -2x^2$ exactly two units to the left?

A. $y = -2(x^2 + 2)$ B. $y = -2x^2 + 2$

C. $y = -2(x - 2)^2$ D. $y = -2(x + 2)^2$ 9._____

10. What is the equation of the parabola shown below? 10._____



A. $y = (x+1)^2 - 1$
B. $y = x^2 + 1$
C. $y = x^2 - 1$
D. $y = (x-1)^2 - 1$

11. If a parabola has a vertex at (3, -1) , the axis of symmetry will be:
A. y = -1 B. y = 3 C. x = -1 D. x = 3 11. _____

For #12 & 13, find the value of *c* that makes each a perfect square.

12. $x^2 - 40x + c$ 12._____

A. 20 B. 100 C. 400 D. 1600

13. $x^2 + 6x + c$ 13._____
A.3 B. 9 C. 0 D. 36

14. Simplify the following $(8 - 5i) - (2 - 3i)$. 14._____

A. $10 - 8i$ B. $6 - 8i$ C. $1 - 34i$ D. $6 - 2i$

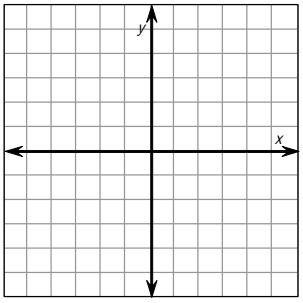
15. Simplify the following $(2 - 3i)(2 + 3i)$. 15._____

A. -5 B. $4 - 9i$ C. 13 D. $13 - 12i$

16. Solve the following equation using any method: $x^2 + 9 = 0$. 16._____

17. Solve the following equation by factoring: $x^2 - 9 = 0$ 17._____

18. Solve the following equation by graphing: $x^2 + 4x + 3 = 0$



x- intercepts: _____

Solve each equation by factoring.

19. $3x^3 - 12x^2 = 0$ 19._____

20. $x^2 - 8x = 9$ 20. _____

21. $12x^2 + 13x + 3 = 0$ 21. _____

22. Solve $x^2 + 6x - 8 = 0$ by completing the square. 22. _____

Solve each equation using any method. For the multiple choice questions, write the letter for the correct answer in the blank at the right.

23. $4x^2 - 5x - 2 = 0$ 23._____

A. $\frac{5 \pm i\sqrt{7}}{8}$ B. $\frac{5 \pm \sqrt{7}}{8}$ C. $\frac{5 \pm i\sqrt{57}}{8}$ D. $\frac{5 \pm \sqrt{57}}{8}$

24. $16x = 9x^2$ 24._____

25. $8x^2 = 24x + 32$ 25._____

Solve using the Quadratic Formula. Show all work and simplify!

26. $7x^2 - 6x + 1 = 0$ 26._____

27. $6x^2 - 5x + 3 = 0$ 27._____

A. $\frac{5 \pm \sqrt{97}}{12}$ B. $\frac{5 \pm i\sqrt{97}}{12}$ C. $\frac{5 \pm i\sqrt{47}}{12}$ D. $\frac{5 \pm \sqrt{47}}{12}$

28. A ball is thrown upward vertically with an initial speed of 72 feet per second. The equation $h = 72t - 16t^2$ gives the height of the ball in t in seconds. Use the calculator to find the maximum height reached by the ball.

28._____

29. Write an equation, then solve using the calculator:
Find two numbers whose sum is 16 and whose product is a maximum.
Equation _____

29. _____

.

30. Write an equation and solve using the calculator:
Gary plans to put a fence around his garden. He has 36 meters of fencing. His garage is used for one side of the garden. What would the dimensions be for the maximum area? Equation _____

30. _____