**Day 7-8 Homework**

**Solve each equation using the quadratic formula. Give exact answers!**

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

| | |
|---|---|
| 1. $4x^2 + 11x - 20 = 0$ | 2. $x^2 - 5x - 24 = 0$ |
| 3. $x^2 = 3x + 3$ | 4. $x^2 + 5 = -5x$ |
| 5. $x^2 = -x + 1$ | 6. $4x^2 - 1 = -8x$ |
| 7. $4x^2 + 7x - 15 = 0$ | 8. $x^2 + 3x - 10 = 0$ |
| 9. $x^2 + 14 = 8x$ | 10. $-3x^2 + 6x = -5$ |
| 11. $4x^2 + 5 = -6x$ | 12. $3x^2 + 4x + 8 = 0$ |
| 13. $3x^2 = 10x + 4$ | 14. $4x^2 - 6x = 14$ |

Select answers. Work the problems then check your answers to make sure you are on the right track.

1. $x = 1.25,\ x = -4$

3. $x = \frac{3 \pm \sqrt{21}}{2}$

## Day 7-8 Homework – Working with the Discriminant

Part 1 - Find the value of the discriminant of each quadratic. Show your work!

**Do first:** The formula to calculate the discriminant is _____

1) $6p^2 - 2p - 3 = 0$

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

3) $-4m^2 - 4m + 5 = 0$

4) $5b^2 + b - 2 = 0$

5) $r^2 + 5r + 2 = 0$

6) $2p^2 + 5p - 4 = 0$

Part 2 - Find the value of the discriminant of each quadratic **AND** state the number of **real** solutions and the number of **imaginary** solutions.

**Do first: Explain** the difference between real and imaginary solutions.

7) $9n^2 - 3n - 8 = -10$

8) $-2x^2 - 8x - 14 = -6$

9) $9m^2 + 6m + 6 = 5$

10) $4a^2 = 8a - 4$

11) $-9b^2 = -8b + 8$

12) $-x^2 - 9 = 6x$

13) $-4r^2 - 4r = 6$

14) $8b^2 - 6b + 3 = 5b^2$

**(Homework is continued on the next page.)**

Part 3 - Find the value of the discriminant of each quadratic **AND** state the number of **rational** solutions, **irrational** solutions and **imaginary** solutions.

**Do first: Explain** the difference between rational and irrational solutions.

15) $-6x^2 - 6 = -7x - 9$

16) $4k^2 + 5k + 4 = -3k$

17) $-7n^2 + 16n = 8n$

18) $2x^2 = 10x + 5$

19) $-10n^2 - 3n - 9 = -2n$

20) $-9r^2 - 8r - 1 = r - r^2 - 9$

Critical thinking questions -

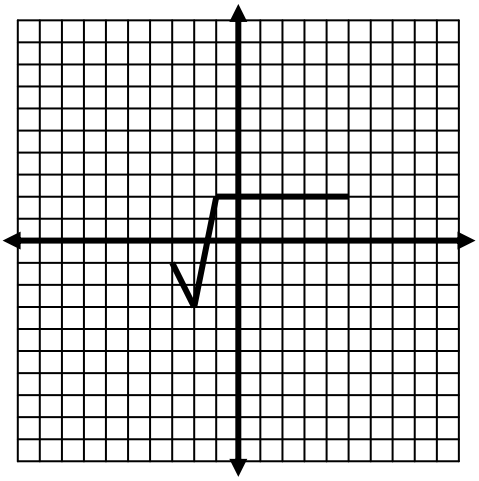
23) Write a quadratic equation that has 2 imaginary solutions and show why your answer must have 2 imaginary solutions.

24) In your own words, explain why a quadratic cannot have only one imaginary solution.

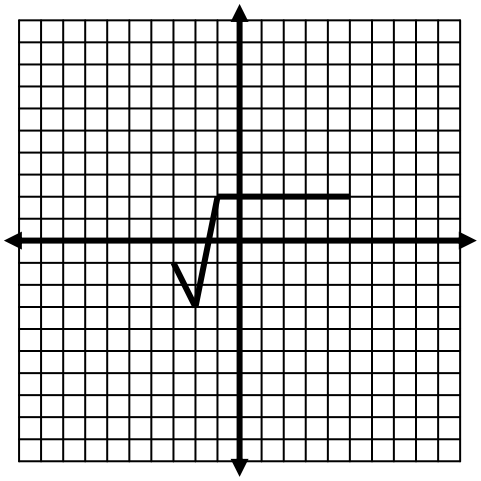
## Day 9 Homework- Fred Functions

**I.** On each grid, **Ginger, G(x)** is graphed. Graph the given function.

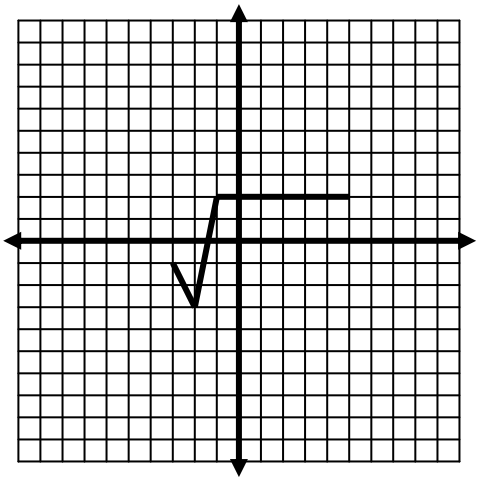
1. Graph: y = G(x) – 6.



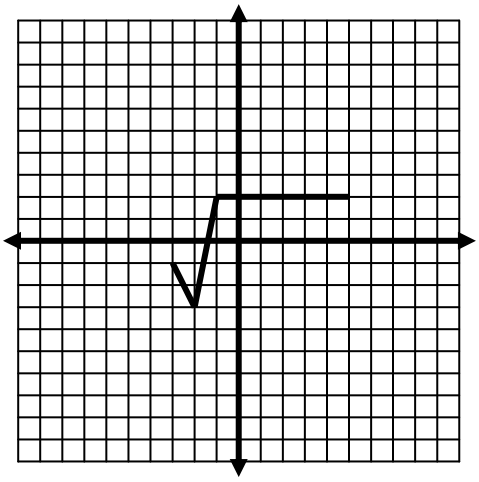
3. Graph: y = G(x + 2) + 5



2. Graph: y = G(x + 6)



4. Graph: y = G(x – 4) – 5



**II.** Using the understanding you have gained so far, describe the effect to Fred for the following functions.

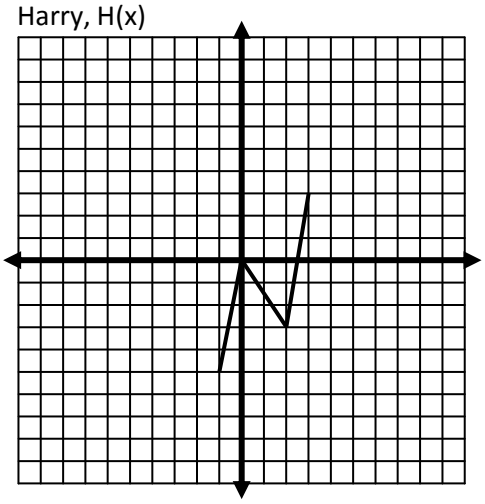
| Equation | Effect to Fred's graph |
|---|---|
| 1. y = F(x) + 82 | |
| 2. y = F(x – 13) | |
| 3. y = F(x + 9) | |
| 4. y = F(x) – 55 | |
| 5. y = F(x – 25) + 11 | |

**III.** Using the understanding you have gained so far, write the equation that would have the following effect on Fred's graph.

| Equation | Effect to Fred's graph |
|---|---|
| 1. | Translate left 51 units |
| 2. | Translate down 76 |
| 3. | Translate right 31 |
| 4. | Translate right 8 and down 54 |
| 5. | Translate down 12 and left 100 |

**IV.** Determine the domain and range of each parent function.

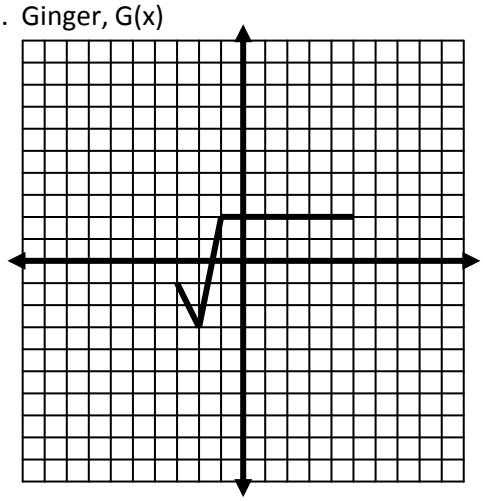
1. Harry, H(x)



Domain: _____

Range: _____

2. Ginger, G(x)



Domain: _____

Range: _____

**V.** Consider a new function, Polly, P(x).
Polly's Domain is $\{x \mid -2 \le x \le 2\}$. Its range is $\{y \mid -3 \le y \le 1\}$.

Use your understanding of transformations of functions to determine the domain and range of each of the following functions. *(Hint: You may want to write the effect to Polly first.)*

1. P(x) + 5

Domain: _____

Range: _____

2. P(x + 5)

Domain: _____

Range: _____

**Day 10 Homework**

## Transformations of quadratic graphs

Describe how the graph of $y = x^2$ is changed to produce the graphs of the following equations? Use vocabulary like *translate, reflect, shrink, stretch* in the blank. If more than one change is needed, you may write up to 3 of these options in the blank. You must be able to answer questions like these without a calculator. **Use your calculator only to check answers.**

1. $y = x^2 + 5$ 1. _____Example: Translate up 5_____

2. $y = (x+2)^2$ 2. _____

3. $y = (x-9)^2$ 3. _____

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

5. $y = x^2 - 3$ 5._____

6. $y = \frac{1}{3}x^2$ 6. _____

7. $y = (x+2)^2 - 3$ 7. _____

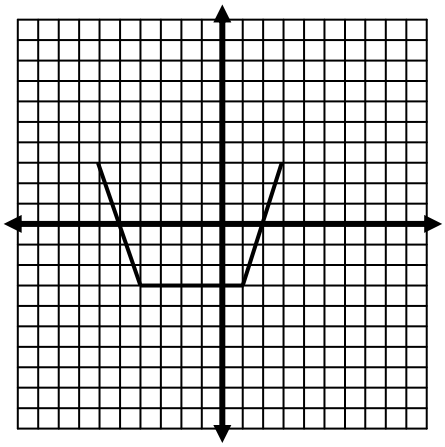
8. $y = 2(x-4)^2$ 8. _____

9. $y = -\frac{1}{2}x^2 + 1$ 9. _____

10. $y = -(x-4)^2 + 2$ 10. _____

11. $y = \frac{2}{5}(x+2)^2 + 1$ 11. _____

12. $y = 3(x-1)^2 - 2$ 12. _____



This is the function **Bowl, B(x)**.

1. List its characteristic points.

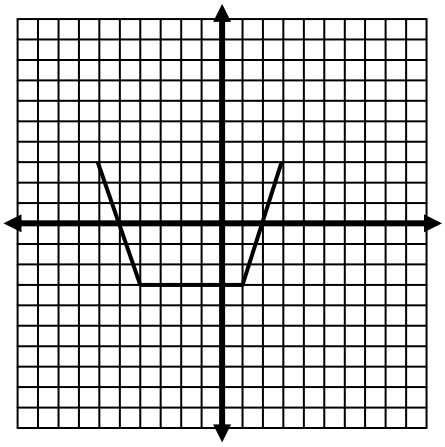
2. Are these the only points on the graph of Bowl? Explain.

3. What is the domain of Bowl?

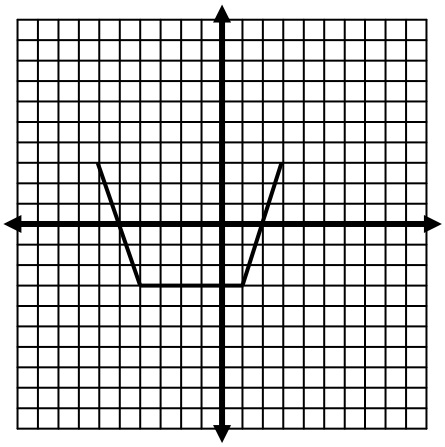
4. What is the range of Bowl?

For each of the following, list the effect on the graph of Bowl and then graph the new function.

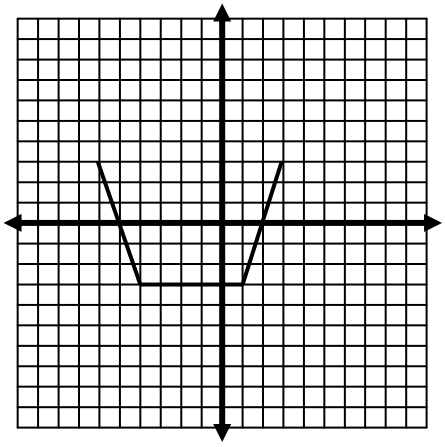
5. $y = B(-x)$



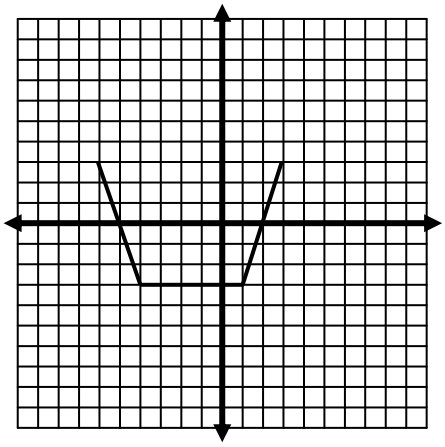
6. $y = -B(x)$



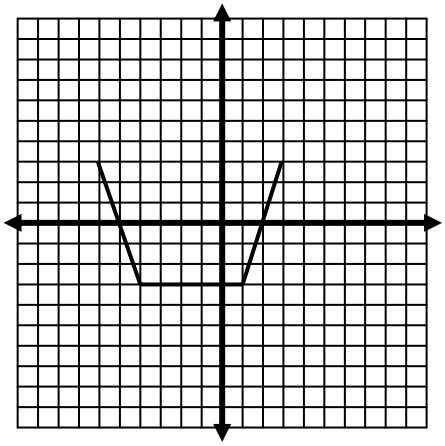
7. $y = -B(x)$



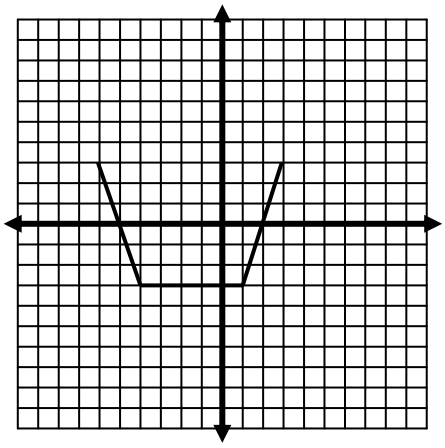
8. $y = 3\,B(x)$



9. $y = B(x - 3)$



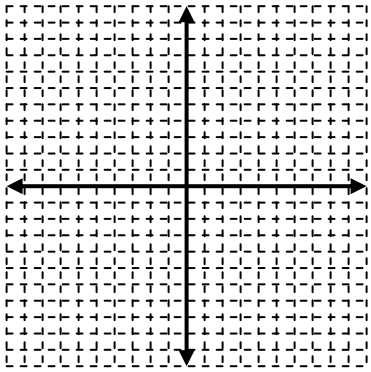
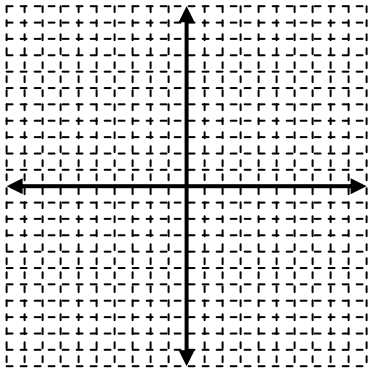
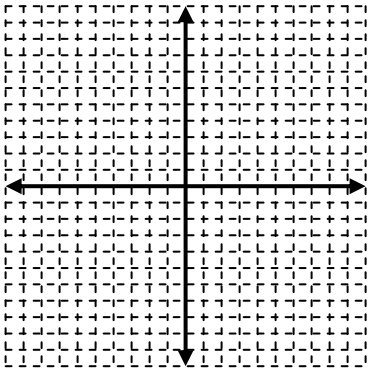
10. $y = B(x + 2) - 1$



**Day 11 Homework – Quadratic Systems and Inequalities**

Graph each quadratic inequality. Remember to show your work algebraically to receive full credit!

1. $y \le -x^2 + 2x - 3$
2. $y > 3x^2 + 18x + 15$
3. $y \le 4x^2 - 1$

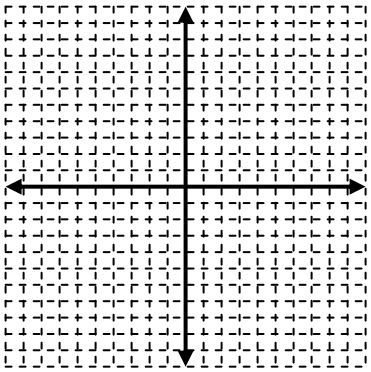
## Solving Quadratic Inequalities

Solve each inequality. Express your solution using set notation.

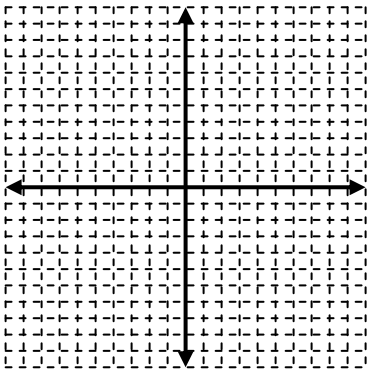
4. $x^2 - x - 20 > 0$
5. $x^2 - 10x + 16 < 0$
6. $x^2 + 4x + 3 \le 0$
7. $9z \le 12z^2$
8. $4t^2 < 9$
9. $9x^2 + 31x + 12 \le 0$
10. $4x^2 + 4x + 1 > 0$
11. $x^2 + 64 \ge 16x$

Solve each system of equations graphically. Remember to show your work algebraically to receive full credit!

12. $y \geq -x^2 - 6x + 5$
    $y \leq -x^2 + 6x$

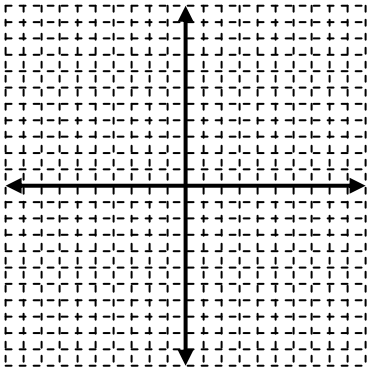


13. $y \geq x^2 - x - 6$
    $y \geq -x^2 - x + 6$



14. Consider the system of equations: $y = 2x^2 + 14x - 15$ and $y = 3x + 25$

    a. Illustrate with a graph what you expect to see.



    b. Find a solution to the system of equations algebraically.

15. Explain how it is possible for a system with a linear equation and a quadratic equation to have no solutions.

## Day 12 Homework – Test Review & Study Guide

Unit 2 Test – Modeling with Quadratics Show ALL work for credit! Use extra paper, if needed.

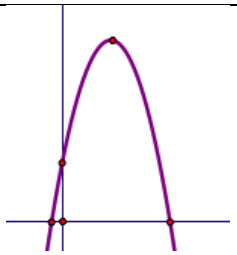
**Factoring**

| | |
|---|---|
| 1. Factor $x^2+8x+15$<br><br>Answer: _____ | 2. Factor $x^2-11x+24$<br><br>Answer: _____ |
| 3. Factor $x^2+x-12$<br><br>Answer: _____ | 4. Factor $3x^2+8x+5$<br><br>Answer: _____ |

**Solving**

| | |
|---|---|
| 5. Solve $(5x-4)(x+3)=0$<br><br>Answer: _____ | 6. Solve $x^2-8x+12=0$<br><br>Answer: _____ |
| 7. Solve $x^2+12=7x$<br><br>Answer: _____ | 8. The quadratic formula is |
| 9. A quadratic has<br><br>a. 2 real solutions when _____<br><br>b. 1 real solution when _____<br><br>c. 0 real solutions when _____ | 10. Find the exact value of the solution(s) of<br>a. $-4x+3=x^2$<br><br>b. $3=3x^2+4x$ |
| 11. How many real solutions does each quadratic have?<br>*a.* $y=x^2+x+5$<br>*b.* $y=x^2+6x+9$<br>*c.* $y=x^2+6x+8$ | 12. How many times will a parabola touch the x-axis if its quadratic has<br>a. 2 real solutions _____<br>b. 1 real solution _____<br>c. 0 real solutions _____ |

**Graphs of Quadratics**

| | |
|---|---|
| 13. Label the graph to show the<br><br>y-intercept<br>zeros<br>vertex |  |
| 14. To find the x-value of the vertex you average the _____. | 15. What are two other vocabulary terms for x-intercept? |

| | |
|---|---|
| 16. The vertex of $y = -x^2 + 8x - 13$ is at | 17. The x-intercepts of $y = x^2 + 2x - 8$ are |
| 18. A parabola opens up (like a smile) if | 19. A parabola opens down (like a frown) if |
| 20. Which parabolas will open up?<br>*a.* $y = -x^2 + 3x - 5$<br>*b.* $y = x^2 - 3x + 5$<br>*c.* $y = x^2 + 3x - 5$<br>*d.* $y = -x^2 - 3x + 5$ | 21. Which parabolas will open down?<br>*a.* $y = -x^2 + 3x - 5$<br>*b.* $y = x^2 - 3x + 5$<br>*c.* $y = x^2 + 3x - 5$<br>*d.* $y = -x^2 - 3x + 5$ |
| 22. The y-intercept of $y = -x^2 + 8x - 13$ is | 23. Describe how the graph of $y = x^2$ is translated for each equation.<br>*a.* $y = x^2 + 4$<br>*b.* $y = x^2 - 5$<br>*c.* $y = (x-3)^2$<br>*d.* $y = 3(x+2)^2$<br>*e.* $y = (x+6)^2 + 2$ |

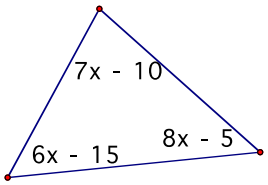
**Applications**

| | |
|---|---|
| 24. A rocket is launched into the air. Its height, in feet, is given by the equation $h\ x\ = -16x^2 + 300x + 20$ . | The starting height of the rocket is _____.<br>The maximum height is _____.<br>The rocket hits the ground after _____ seconds. |
| 25. Two teenagers throw pennies from the top of the school. The quadratics at the right show how high each penny over time.<br>What are the maximum heights of each penny?<br>When did each penny hit the ground? | Emily: $y = -16x^2 + 20x + 47$<br>Aishah: $y = -16x^2 + 15x + 47$ |
| 26. You are working as an intern for Isaac Newton. Professor Newton is researching the behavior of gravity. He gathered the data to the right showing the height of a projectile at different times.<br>a. What is the equation of the quadratic that matches the data?<br>b. When will the object hit the ground? | |

| *x* | *y* |
|---|---|
| 0 | 12 |
| 1 | 15 |
| 2 | 16 |
| 5 | 7 |

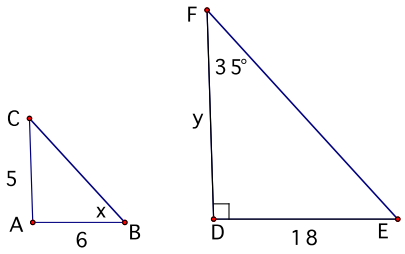
**Review from last unit**

27. Solve for *x*.




Answer _____

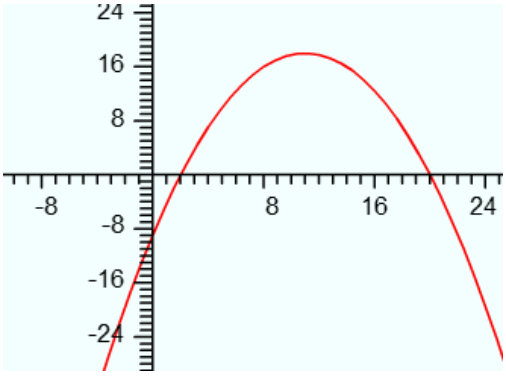
28. In the figure to the right, ΔABC ~ ΔDEF. What do *x* and *y* equal?




*x* = _____ *y* = _____

29. Given B is between A and C, AB = 2*x* +9, BC = 4*x* – 7, and AC = 38. Find BC.

30. Write the equation of the parabola in the graph below. The vertex is at (11, 18).




_____

31. Meg is building a garden up against one side of her house. She has 150 feet of fencing. Find the dimensions of the dog's pen to maximize the area.

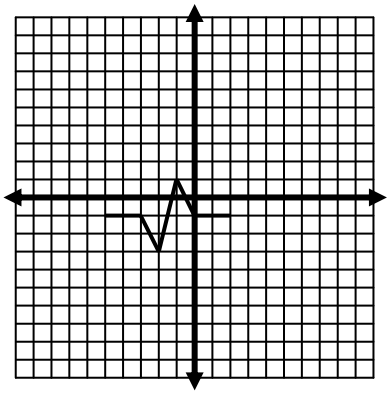
Solve each quadratic inequality. Express your solutions using set notation.

32. $x^2 + 5x \geq 24$

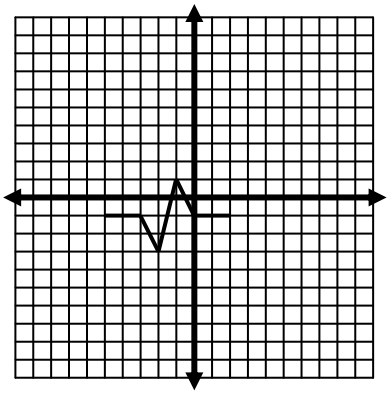
33. $5x^2 + 10 \geq 27x$

For each of the following, list the effect on the graph of Cardio, C(x), shown below. Then graph the new function.

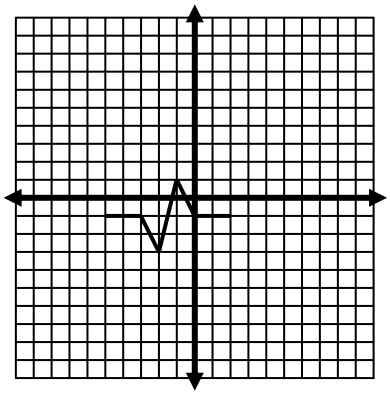
34. y = C(– x)



35. y = –1/3 C(x)

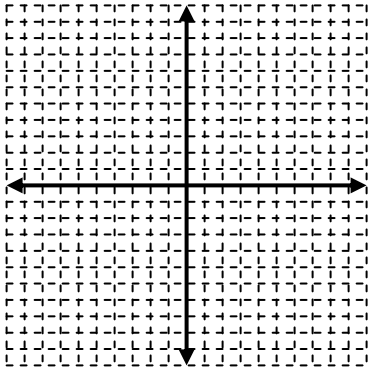


36. y = C(x + 2) – 5



Graph each quadratic inequality. Remember to show your work algebraically to receive full credit!

37. $y > -x^2 + 4x + 5$



x-intercepts: _____

vertex: _____

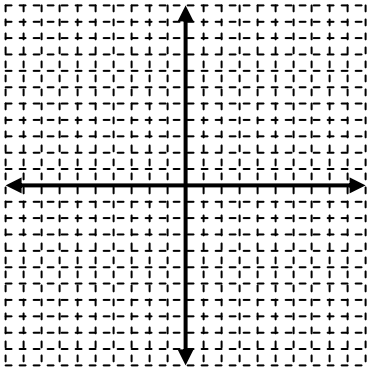
is vertex a max or min?

_____

y-intercept: _____

AoS: _____

38. $y \le x^2 + 6x + 8$



x-intercepts: _____

vertex: _____

is vertex a max or min?

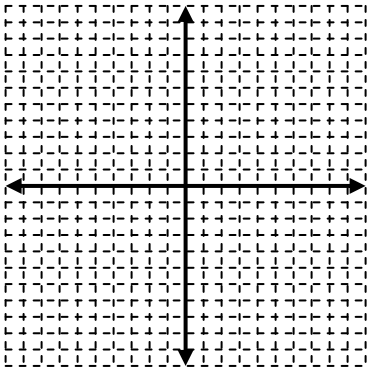
_____

y-intercept: _____

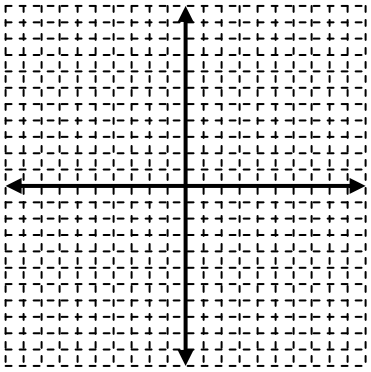
AoS: _____

Solve each system of equations. Remember to show your work algebraically to receive full credit!

39. $y = -x^2 + 2x$
$y = x^2 + 2x$



40. $y = x^2$
$y = -x + 2$



Selected Answers:

1. (x+3)(x+5)
2. (x-8)(x-3)
3. (x+4)(x-3)
4. (3x+5)(x+1)

5. x = 4/5, x = -3
6. x = 2, x = 6
7. x = 3, x = 4

8. $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

9a. $b^2 - 4ac$ is positive
9b. $b^2 - 4ac$ is zero
9c. $b^2 - 4ac$ is negative

10.
a.
$$x = \frac{-4 \pm \sqrt{28}}{2} = \frac{-4 \pm 2\sqrt{7}}{2} = -2 \pm \sqrt{7}$$
b.
$$x = \frac{-4 \pm \sqrt{52}}{6} = \frac{-4 \pm 2\sqrt{13}}{6} = \frac{-2 \pm \sqrt{13}}{3}$$

11a. 0, 11b. 1, 11c. 2
12a. 2, 12b. 1, 12c. 0
14. zeros
15. zero, root
16. (4,3)
17. (-4,0), (2,0)
18. if $x^2$ is positive
19. if $x^2$ is negative
20. b and c
21. a and d
22. (0, -13)

23a. up 4
23b. down 5
23c. right 3
23d. 3 times narrower, and left 2
23e. left 6 and up 2

24. starting height = 20 feet
max height = 1426 feet
hits ground in 18.8 sec

25. Emily height 53.25 feet
Aishah height 50.52 feet
Emily time 2.45 sec
Aishah time 2.25 sec

26a. $y = -x^2 + 4x + 12$
26b. 6 seconds

27. x = 10
28. x = 55, y = 15
29. BC = 17
30.
y = -18/81x$^2$+ 44/9x – 80/9
31. 37.5 ft by 75 ft