1. Factor $x^2+8x+15$

Answer: $(x+5)(x+3)$

2. Factor $x^2-11x+24$

Answer: $(x-8)(x-3)$

3. Factor x^2+x-12

Answer: $(x+4)(x-3)$

4. Factor $3x^2+8x+5$ use "bustin' the b" s

$3x^2+3x+5x+5$

$3x(x+1)+5(x+1)$

Answer: $(3x+5)(x+1)$

Factor And Solve:

5. Solve $(5x-4)(x+3)=0$

Answer: $x=\frac{4}{5}, -3$

6. Solve $x^2-8x+12=0$ $(x-6)(x-2)=0$

Answer: $6, 2 = x$

7. Solve $x^2+12=7x$

$x^2-7x+12=0$

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

Answer: $x=4, 3$

8. The quadratic formula is

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

9. A quadratic has

Discriminant

a. 2 real solutions when $b^2-4ac>0$ positive

rational if ⊕ perfect sq.

irrational if ⊕ non square

b. 1 real solution when $b^2-4ac=0$

rational

c. 0 real solutions when $b^2-4ac<0$ negative

→ two imaginary solutions

10. Find the exact value of the solution(s) of Ex

a. $-4x+3=x^2$

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

$x=\frac{-4\pm\sqrt{(4)^2-4(1)(-3)}}{2(1)}$

$x=\frac{-4\pm\sqrt{28}}{2}=\frac{-4\pm2\sqrt{7}}{2}=\boxed{-2\pm\sqrt{7}}$

b. $3=3x^2+4x$

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

$x=\frac{-4\pm\sqrt{(4)^2-4(3)(-3)}}{2(3)}=\frac{-4\pm\sqrt{52}}{6}=\frac{-4\pm2\sqrt{13}}{6}$

$\boxed{\frac{-2\pm\sqrt{13}}{3}}$

11. How many real solutions does each quadratic have?

a. $y=x^2+x+5$ $(1)^2-4(1)(5)=1-20=-19$ $\boxed{\text{0 real}}$ 2 imaginary

b. $y=x^2+6x+9$ $(6)^2-4(1)(9)=0$ $\boxed{\text{1 real,}}$ rational solution

c. $y=x^2+6x+8$ $(6)^2-4(1)(8)$ $36-32=4$ $\boxed{\text{2 real,}}$ rational solutions

12. How many times will a parabola touch the x-axis if its quadratic has

a. 2 real solutions two

b. 1 real solution one

c. 0 real solutions zero

→ two imaginary solutions

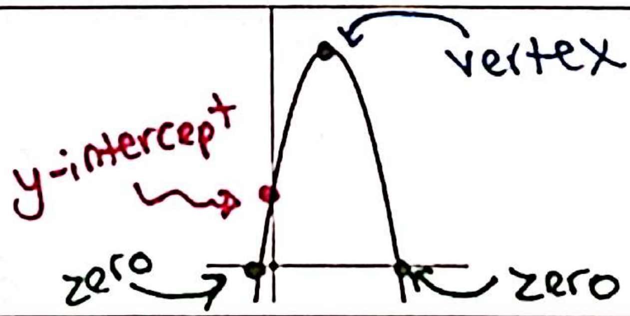
Graphs of Quadratics

13. Label the graph to show the

y-intercept

zeros

vertex



14. To find the x-value of the vertex by hand, you use the formula $x=\frac{-b}{2a}$.

15. What are two other vocabulary terms for x-intercept?

root, zero

16. The vertex of $y=-x^2+8x-13$ is at

$x=\frac{-8}{2(-1)}=\frac{-8}{-2}=4$ $\boxed{(4,3)}$

17. The x-intercepts of $y=x^2+2x-8$ are

$(x+4)(x-2)$
$x=-4, 2$

$\boxed{(-4,0) \text{ and } (2,}$

18. A parabola opens up (like a smile) if

$a>0$ ("a" is positive)

19. A parabola opens down (like a frown) if

$a<0$ ("a" is negative)

20. Which parabolas will open up?

a. $y=-x^2+3x-5$

b. $y=x^2-3x+5$

c. $y=x^2+3x-5$

d. $y=-x^2-3x+5$

$\left.\begin{matrix} b \\ c \end{matrix}\right\}$ positive "a" values

21. Which parabolas will open down?

a. $y=-x^2+3x-5$

b. $y=x^2-3x+5$

c. $y=x^2+3x-5$

d. $y=-x^2-3x+5$

negative "a" values

22. Determine the amount and type of solutions of $y=-x^2+8x-13$

Discriminant $=b^2-4ac$ determines

$=(8)^2-4(-1)(-13)=64+{-42}=22$

2 real (because ⊕ discr.)

irrational (because non-square discriminant)

roots

23. Describe how the graph of $y=x^2$ is translated for each equation.

a. $y=x^2+4$ translated up 4

b. $y=x^2-5$ translated down 5

c. $y=(x-3)^2$ translated right 3

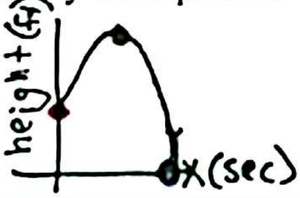
d. $y=3(x+2)^2$ translated left 2 + stre

e. $y=(x+6)^2+2$

translated left 6 and up 2

Applications

24. A rocket is launched into the air. Its height in feet, after x seconds, is given by the equation $h(x)=-16x^2+300x+20$.



The starting height of the rocket is 20 ft.
↳ time = x = 0 ⟶ get y-value of

The maximum height is 1426 ft.
↳ vertex y-value

The rocket hits the ground after 18.8 seconds.
y = 0 ⟶ find x-intercept

25. Two teenagers throw pennies from the top of the school. The quadratics at the right show how high each penny over time.

Emily: $y=-16x^2+20x+47$

Isaiah: $y=-16x^2+15x+47$

find y-value of vertex

What are the maximum heights of each penny?

Emily: 53.25 ft   Isaiah: 50.52 ft

When did each penny hit the ground? ⟶ hit the ground when y= so find x-interc

Emily: 2.45 sec   Isaiah: 2.25 sec

26. Solve the equation by completing the square: $x^2 + 6x = -22$

$x^2+6x+\underline{9}=-22+\underline{9}$

$(b/2)^2$

$\sqrt{(x+3)^2}=\sqrt{-13}$

27. Find the vertex form of $y = x^2 + 4x + 1$

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

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

28. Find the vertex form of $y = -2x^2 + 6x + 1$

$y = -2(x^2 - 3x + \underline{9/4} - \underline{9/4} - 1/2)$

$y = -2((x - 3/2)^2 - 11/4)$

$y = -2(x - 3/2)^2 - 11/4 \cdot -2$

$y = -2(x - 3/2)^2 + 11/2$

Answer $y = -2(x - 3/2)^2 + 11/2$

29. Solve by hand $-4x^2 + 80 = 0$

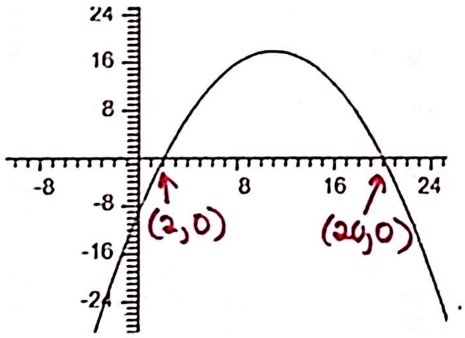
$-4x^2 = -80$

$x^2 = 20$

$\sqrt{x^2} = \pm\sqrt{20}$

Answer $\pm 2\sqrt{5}$

30. Write the equation, in standard form, of the parabola in the graph below. The vertex is at (11, 18). Show ALL your work by hand.



$y = -\frac{2}{9}x^2 + \frac{44}{9}x - \frac{80}{9}$

$y = a(x - \text{root})(x - \text{root})$

$y = a(x-2)(x-20)$

$18 = a(11-2)(11-20)$

$18 = a(9)(-9)$

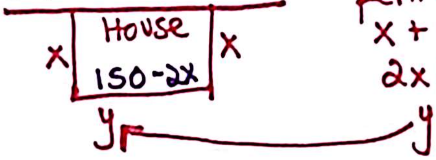
$\frac{18}{-81} = a \qquad a = \frac{-2}{9}$

$y = a(x-2)(x-20)$

$y = \frac{-2}{9}(x^2 - 22x + 40)$

$y = \frac{-2}{9}x^2 + \frac{44}{9}x - \frac{80}{9}$

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.



perimeter = 150

$x + y + x = 150$

$2x + y = 150$

$y = 150 - 2x$

Area = L·W

Area = $x(150 - 2x)$

Area = $150x - 2x^2$

maximum = vertex

(37.5, 2812.5)

side = x   y = Area

one side = 37.5 ft

other side = 150 − 2(37.5) = 75

$\boxed{\text{37.5 ft by 75 ft}}$

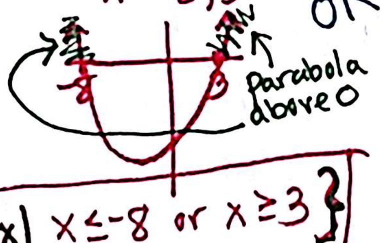
Solve each quadratic inequality. Express your solutions using set notation.

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

$x^2 + 5x - 24 \geq 0$

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

$x = -8, 3$



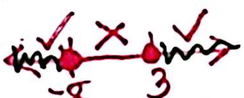
OR

In each area, test points

① $(-10)^2 + 5(-10) - 24 \geq 0$ ✓

② $(0)^2 + 5(0) - 24 \geq 0$ ✗

③ $(10)^2 + 5(10) - 24 \geq 0$ ✓



$\boxed{\{x \mid x \leq -8 \text{ or } x \geq 3\}}$

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

$5x^2 - 27x + 10 \geq 0$

$5x^2 - 25x - 2x + 10 = 0$

$5x(x-5) - 2(x-5) = 0$

$(5x-2)(x-5) = 0$

$x = 2/5, 5$

In each area, test points

① $5(0)^2 - 27(0) + 10 \geq 0$ ✓

② $5(2)^2 - 27(2) + 10 \geq 0$ ✗

③ $5(10)^2 - 27(10) + 10 \geq 0$ ✓

$\boxed{\{x \mid x \leq 2/5 \text{ or } x \geq 5\}}$

Honors Math 2 Unit 1 Test #2 Review

For each of the following, determine the equation for the transformation shown below, from the parent graph $y = x^2$. Then write the equation in standard form.

34. Translated left 4, down 3 } V (-4,-3)

vertex form → $y = (x+4)^2 - 3$

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

$y = x^2 + 8x + 16 - 3$

standard form → $\boxed{y = x^2 + 8x + 13}$

35. Translated right 3 and reflected over the x-axis } V (3,0) → y's switch OR sign a=-1 (not 1)

vertex form → $y = -(x-3)^2$

$y = -(x-3)(x-3)$

$y = -(x^2 - 6x + 9)$

standard form → $\boxed{y = -x^2 + 6x - 9}$

36. Translated left 5, up 2, and vertically stretched by 3 → a=3 (not 1) V (-5,2)

$y = 3(x+5)^2 + 2$ ← vertex form

$y = 3(x+5)(x+5) + 2$

$y = 3(x^2 + 10x + 25) + 2$

$y = 3x^2 + 30x + 75 + 2$

standard form → $\boxed{y = 3x^2 + 30x + 77}$

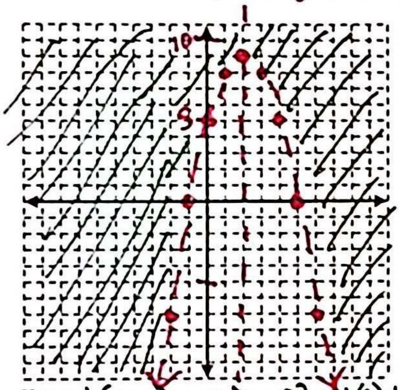
Graph each quadratic inequality or system. Fill in the values requested. Remember to show your work algebraically to receive full credit! → > (not ≥) so dashed parabola

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

$-1(x^2 - 4x - 5)$

$-1(x-5)(x+1)$

$x = 5, -1$ → (5,0)



x-intercepts: (-1,0) (5,0)

vertex: (2,9) $x = \frac{-4}{2(-1)} = 2$

is vertex a max or min? max (a=-1 so frown)

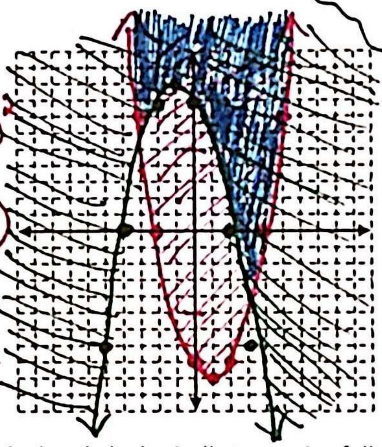
y-intercept: (0,5) ← c-value when standard form

AoS: $x = 2$

Test (0,0) $0 > -0^2 + 4(0) + 5$ ⊗ FALSE

38. $y \geq x^2 - 2x - 8$ → $(x-4)(x+2)$ x-int (4,0) (-2,0) y-int (0,-8) vertex (1,-9) AoS $x=1$ test (0,0) $0 \geq 0^2 - 2(0) - 8$ ✓ TRUE

$y \geq -x^2 - 2x + 8$



$0 = -1(x^2 + 2x - 8)$

$0 = -1(x+4)(x-2)$

x-int (-4,0) (2,0)

y-int (0,8)

vertex (-1,9)

AoS $x = -1$

test (0,0)

$0 \geq -0^2 - 2(0) + 8$

⊗ FALSE

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

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

$y = x^2 + 2x$

$0 = -x(x-2)$ AoS $x=1$

x-int (0,0) (2,0)

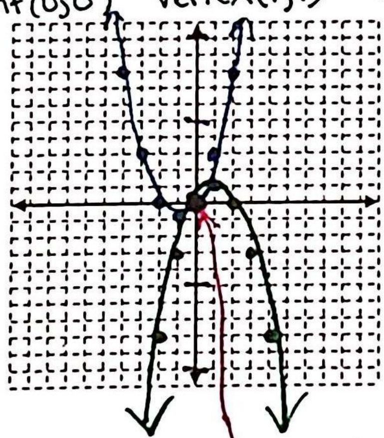
y-int (0,0) vertex (1,1)

$x^2 + 2x = -x^2 + 2x$

$2x^2 = 0$

$\sqrt{x^2} = \sqrt{0}$

$x = 0$ $\boxed{(0,0)}$ Algebraic work for solution



$y = x^2 + 2x$

$0 = x(x+2)$

(0,0) (-2,0) x-int

(0,0) y-int

(-1,-1) vertex

$x = -1$ AoS

solution is intersection point $\boxed{(0,0)}$

40. $y = x^2$

$y = -x + 2$

(0,0) x-int + vertex + y-int

$x^2 = -x + 2$

$x^2 + x - 2 = 0$

$(x+2)(x-1) = 0$

$x = -2, 1$

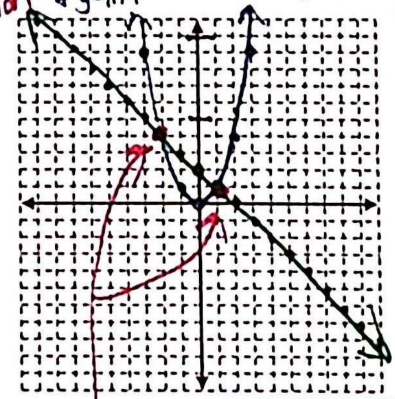
$x = -2$

$y = (-2)^2 = 4$

$\boxed{(-2,4)}$

$x = 1$

$y = (1)^2 = 1$ $\boxed{(1,1)}$



$y = -x + 2$

$mx + b$

y-int (0,2)

m = slope = -1

Solutions $\boxed{(-2,4)}$ $\boxed{(1,1)}$ are intersection points

11a. 0, 11b. 1, 11c. 2

12a. 2, 12b. 1, 12c. 0

14. use x = -b/2a

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. 2 real irrational roots

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
Isaiah height 50.52 feet
Emily time 2.45 sec
Isaiah time 2.25 sec

26. $\cancel{-3 \pm i\sqrt{3}}$
$-3 \pm i\sqrt{13}$

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

28. $y = -2(x - 3/2)^2 + 11/2$

29. $2\sqrt{5}$, $-2\sqrt{5}$

30.
$y = -18/81x^2 + 44/9x - 80/9$

31. 37.5 ft by 75 ft

32. a. $\{x | x \leq -8 \text{ or } x \geq 3\}$

b. $\{x | x \leq \frac{2}{5} \text{ or } x \geq 5\}$

Honors Math 2 Unit 1 Test #2 Review 6

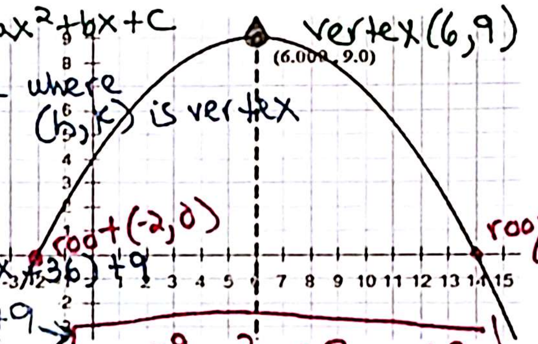
Review and Practice of application problems.

1. Which one of these is the standard form of $y = (x-2)^2 + 3$?

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

a) $y = x^2 + 4x + 7$ b) $y = x^2 - 4x + 7$ c) $y = x^2 - 4x + 4$ d) $y = x^2 + 7$

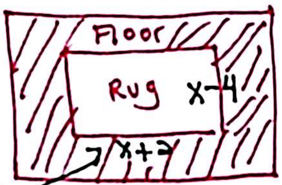
2. Write Equation of the Parabola in Standard Form. $\}y=ax^2+bx+c$
Show ALL work by hand!!



$y=a(x-\text{root})(x-\text{root})$
$y=a(x+2)(x-14)$
$9=a(6+2)(6-14)$
$9=a(8)(-8)$
$\frac{9}{-64}=a$
$y=\frac{-9}{64}(x+2)(x-14)$

OR $y=a(x-h)^2+k$ where (h,k) is vertex
$y=a(x-6)^2+9$
$0=a(14-6)^2+9$
$0=a(8)^2+9$
$\frac{-9}{64}=\frac{64a}{64}$
$y=\frac{-9}{64}(x-6)^2+9$ $y=\frac{-9}{64}(x^2-12x+36)+9$
$y=\frac{-9}{64}x^2+\frac{27}{16}x-\frac{81}{16}+9$
$y=\frac{-9}{64}(x^2-12x-28)$ → $\boxed{y=\frac{-9}{64}x^2+\frac{27}{16}x+\frac{63}{16}}$

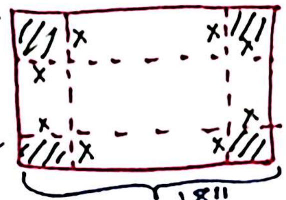
3. A rectangular floor has a rectangular rug on it. The floor's width is 5 feet greater than the floor's length, x. The rug's width is 3 feet less than the floor's width. The rug's length is 6 feet less than the rug's width. Write a function, R(x), in simplified form to represent the area of the floor not covered by the rug.



rug width $=(x+5)-3$ = floor width -3

R(x) = Area of floor not covered with rug
R(x) = Area of full floor − Area of Rug
$R(x)=(x+5)(x)-(x+2)(x-4)$
$R(x)=x^2+5x-(x^2-2x-8)$
$R(x)=x^2+5x-x^2+2x+8$ $\boxed{R(x)=7x+8}$

4. A piece of cardboard that is 14 inches by 18 inches is used to form a box with an open top by cutting away congruent squares with side lengths, x, from the corners. Write an equation y, in terms of x, in standard form to model the surface area of the open box after the corners are cut away.



Surface Area = Area of all surfaces of the figure = Area of Full Rectangle − Area of 4 congruent squares

Surface Area $=(18)(14)-4x^2=252-4x^2$

$y=\boxed{\text{Surface Area}=-4x^2+252}$ ← standard form

5. Each year, a local school's Rock the Vote committee organizes a public rally. Based on previous years, the organizers decided that the Income from ticket sales, I(t) is related to ticket price *t* by the equation $I(t) = 400t - 40t^2$. $=-40t^2+400t$

maximum → Get vertex $x=\frac{-b}{2a}=\frac{-400}{2(-40)}$
$x=5=t$

a. What ticket price(s) would generate the greatest income? What is the greatest income possible? Explain how you obtained the value you got.

Ticket price(s) \$5.00 Income \$1000.00 $y=I(t)=400(5)-40(5)^2$
$2000-1000$

b. At what ticket price(s) would there be no income from the ticket sales. Explain how you obtained the answer.

$y=0$ ⇒ find x-intercept

Ticket prices of \$0 and \$10 yield no income

$0=400t-40t^2$
$0=-40t^2+400t$
$0=-40t(t-10)$
$t=0,10$

There is NO income, or $y=I(t)=0$, at the x-intercepts. I found those by factoring and setting each factor $=0$ to solve.