McKinney Boyd High School

QCA #2 Review: Unit 1 – 3

Name: Answer Key Period: ______ Date: ________________

Unit 1: Linear Functions

slope $= \dfrac{y_2 - y_1}{x_2 - x_1}$

slope-intercept Form

$y = mx + b$

1. **Match each equation to its table.**

A. slope $= \dfrac{4-2}{0-(-2)}$ slope $= \dfrac{2}{2} = \boxed{1}$

y-int = 4

A.

x	-2	0	1	3
y	2	4	5	7

B. slope $= \dfrac{-9-(-7)}{3-2} = \boxed{-2}$

B.

x	-4	-1	2	3
y	5	-1	-7	-9

C. slope $= \dfrac{4-3}{0-(-4)} = \boxed{\dfrac{1}{4}}$

C.

x	-4	0	4	8
y	3	4	5	6

y-int = 4

D.

x	0	2	3	6
y	-3	7	12	27

D. slope $= \dfrac{-3-7}{0-2} = \dfrac{-10}{-2}$ slope = 5

E.

x	-5	0	5	10
y	-4	-6	-8	-10

E. slope $= \dfrac{-4-(-6)}{-5-0} = \dfrac{2}{-5} = -\dfrac{2}{5}$

F.

x	-6	-4	0	6
y	-4	-3	-1	2

F. y-int = −1

D $y = 5x - 3$ slope = 5 y-int = −3

B $y = -2x - 3$ slope = −2

C $y = \frac{1}{4}x + 4$ slope = $\frac{1}{4}$ y-int = 4

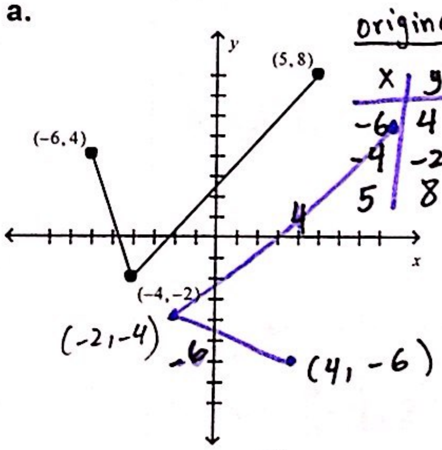
E $y = -\frac{2}{5}x - 6$ slope = $-\frac{2}{5}$

F $y = .5x - 1$ y-int = −1

A $y = x + 4$ slope = 1 y-int = 4

2. **Draw the inverse relations of the line segment or figure shown below. Give the domain and range of the original image.** (Inverse Reflects across $y=x$)

a.



original

x	y
−6	4
−4	−2
5	8

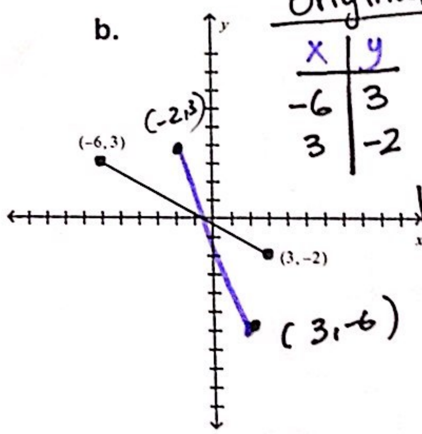
Inverse

x	y
4	−6
−2	−4
8	5

switch x & y

Domain: $[-6, 5]$ Range: $[-2, 8]$

b.



Original

x	y
−6	3
3	−2

Inverse

x	y
3	−6
−2	3

switch x & y

Domain: $[-6, 3]$ Range: $[-2, 3]$

3. **Write each ordered pair with the system of equations for which it is a solution:**

Method 1
Solve the system & Find the point of int.

(2,3) (4,−1) (8,6) (1,4)

Method 2
Plug in the pt in the system to find out which one is the solution

$x + y = 3$ Elimination
$-1(2x + y = 7)$
$x + y = 3$
$-2x - y = -7$
$-x = -4$
$\boxed{x = 4}$
$\boxed{(4,-1)}$

$x + y = 5$ Substit
$3x - 2y = 0$
$\boxed{(2,3)}$
$x = -y + 5$
$3(-y+5) - 2y = 0$
$-3y + 15 - 2y = 0$
$-5y + 15 = 0 \rightarrow \dfrac{-5y}{-5} = \dfrac{-15}{-5}$
$\boxed{y = 3}$

$x - y = 2$ Plug in
$2x + y = 22$
$\boxed{(8,6)}$
$8 - 6 = 2$ ✓
$2(8) + 6 \stackrel{?}{=} 22$
$16 + 6 = 22$ ✓

$(x + y = 5)\cdot -1$
$2x + y = 6$ Elim
$-x - y = -5$
$+2x + y = 6$
$\boxed{x = 1}$
$\boxed{(1,4)}$

4. **Write the domain and range for each of the relations below, and state whether the relation is a function, or not.**

Discrete:

Continuous:

$\{(6,6),(7,8),(0,5),(2,3)\}$

Domain: {0, 2, 6, 7}

Range: {3, 5, 6, 8}

Is it a function? YES NO

x is not repeated

$f(x) = 2x - 4$ Linear Function

Domain: (−∞, ∞)

Range: (−∞, ∞)

Is it a function? YES NO

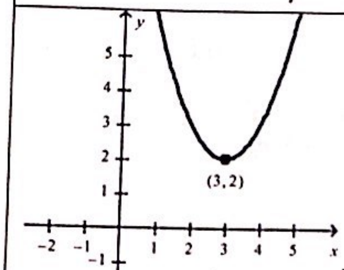
$\{(5,2),(5,3),(2,3),(0,0)\}$

Domain: {0, 2, 5}

Range: {0, 2, 3}

Is it a function? YES NO

5 is repeated

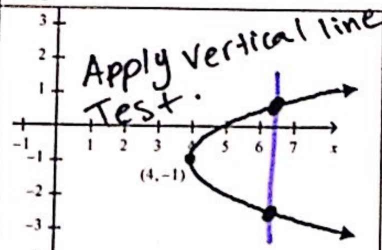


Domain: (−∞, ∞)

Range: [2, ∞)

Is it a function? YES NO

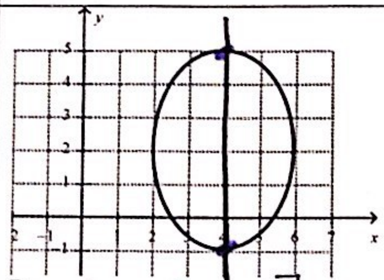
Quadratic. Function



Domain: [4, ∞)

Range: (−∞, ∞)

Is it a function? YES NO

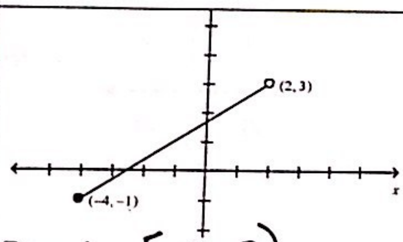


Domain: [2, 6]

Range: [−1, 5]

Is it a function? YES NO

Apply Vertical Line Test.

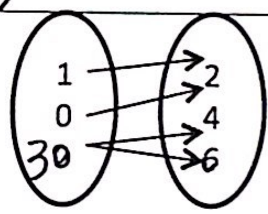


Domain: [−4, 2)

Range: [−1, 3)

Is it a function? YES NO

Passes Vertical Line Test



Domain: {1, 0, 30}

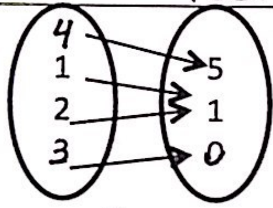
Range: {2, 4, 6}

Is it a function? YES NO

$30 \to 4, 6$

(30, 4) (30, 6)

30 is repeated



Domain: {1, 2, 3, 4}

Range: {5, 1, 0}

Is it a function? YES NO

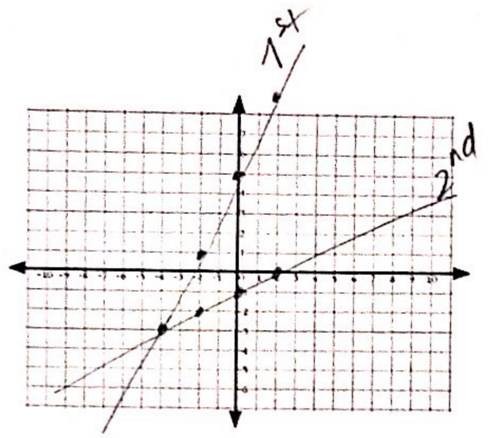
Each Input has one output

5. Create the graph to match the data in the table

x	y_1	y_2
−4	−3	−3
−2	1	−2
0	5	−1
2	9	0

1st graph
(-4,-3)
(-2,1)
(0,5)
(2,9)

2nd graph
(-4,-3)
(-2,-2)
(0,-1)
(2,0)



$P = \boxed{2(l+w)=96} \Rightarrow L+w = 96 \div 2 = 48$

6. The perimeter of a rectangular garden is 96m. Twice the width of the garden is 3 meters less than its length. Which system of equations could be used to find the length (L) and the width (W) of the garden?
Find W using either elimination or substitution

$2w = L - 3$
$\boxed{2w - L = -3}$

A. 2(L + W) = 96
2W = L - 3

B. L + W = 48
2W = L + 3

C. 2(L + W) = 48
2W = L - 3

D. 2(L + W) = 96
2W = L + 3

$\begin{cases} 2(L+w) = 96 \\ 2w - L = -3 \end{cases}$

$\cancel{L} + w = 48$
$2w - \cancel{L} = -3$
$3w = 45$
$\boxed{w = 15m}$

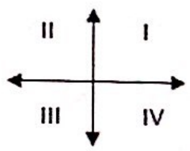
by elimination

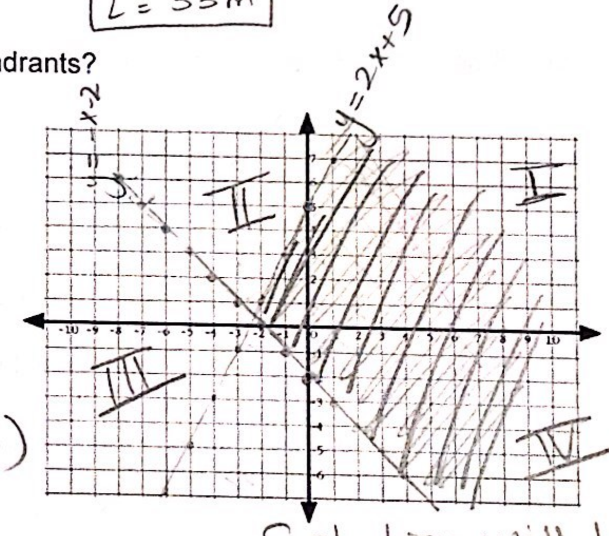
$L + w = 48$
$L + 15 = 48$
$\boxed{L = 33m}$

7. Graph the system of inequalities:
The solution of the system will be in what quadrants?

$y \le 2x + 5$
$y \ge -x - 2$

Hint:





$y \le 2x+5$
Graph $y = 2x+5$ (Shade below
solid Line)

$y \ge -x-2$
Graph $y = -x-2$ (Shade above
Solid Line)

Solution will be
in I, II, III & IV

8. Mrs. Clark is 27 years older than her daughter. Together their ages total 51 years. Find their ages. You must **identify** your variables, **write** a system of equations, **show your work** to find the solution and **label** your answer.

x age of Mrs Clark
y age his daughter

$x + y = 51$
$x = y + 27$

His daughter is 12 yrs old
He is 39 yrs old.

Substitution

$y + 27 + y = 51$
$2y = 51 - 27 = 24$
$y = 12$

Unit 2: Absolute Value

1. Solve the following Absolute Value equations:

$|x-18|=5$

① $x-18=5$
$+18 \quad +18$
$\boxed{x=23}$

② $x-18=-5$
$+18 \quad +18$
$\boxed{x=13}$

Remember to Check your answers.

$-2|3a-2|=6$
$\div -2 \quad \div -2$
$|3a-2|=-3$
No Solution

$|2w+3|+6=2$
$-6 \quad -6$
$|2w+3|=-4$
No solution

2. Describe the transformations of the following Absolute Value Equations

$f(x)=3|x+5|-2$ → Translated Horiz 2 units down
Vertically stretched (Narrower)
translated Horizantally 5 units left

$f(x)=\frac{1}{3}|x-4|-9$
* Vertically compressed (wider)
* Translated 4 units Right
* Translated 9 units down

$f(x)=-2|x+2|-7$
* Reflected across x-axis
* 2 units Left
* 7 units down

Unit 3: Quadratic Functions

1. Using the graph of $f(x)=x^2$ as a guide, describe the transformations of the function $g(x)=(x+6)^2-2$. 2 down 6 Left
   a. $g(x)$ is $f(x)$ translated 2 units left and 6 units down.
   b. $g(x)$ is $f(x)$ translated 6 units right and 2 units up.
   c. $g(x)$ is $f(x)$ translated 6 units left and 2 units down.
   d. $g(x)$ is $f(x)$ translated 2 units right and 6 units up.

2. The quadratic equation $f(x)=(x+2)^2-5$ was translated right 3 units and up 7 units. Write a new equation that reflects the transformed graph.
-3 +7

$$(x+2-3)^2-5+7$$

$$\boxed{f(x)=(x-1)^2+2}$$

3. Consider the function $f(x) = -4x^2 - 8x + 10$. Determine whether the graph opens up or down. Find the axis of symmetry, the vertex and the y-intercept. *a negative opens down.

a. The parabola opens downward.
The axis of symmetry is the line $x = -1$.
The vertex is the point $(-1, 14)$.
The y-intercept is 10.

$$* \quad x = \frac{-b}{2a} = \frac{-(-8)}{2(-4)} = \frac{8}{-8}$$

$\boxed{x = -1}$ axis of symmetry

X. The parabola opens upward. X
The axis of symmetry is the line $x = -1$.
The vertex is the point $(-1, 14)$.
The y-intercept 10.

* y-int $= 10$

X. The parabola opens upward. X
The axis of symmetry is the line $x = -1$.
The vertex is the point $(-1, -6)$.
The y-intercept -5.

* Vertex $x = -1$

$y = -4(-1)^2 - 8(-1) + 10$

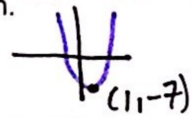
$y = -4 + 8 + 10 = 14$

$(-1, 14)$

X. The parabola opens downward.
The axis of symmetry is the line $x = -1$.
The vertex is the point $(-1, 7)$.
The y-intercept is 5. X

4. Find the vertex of $f(x) = x^2 - 2x - 6$. Then state the domain and range of the function.

$x = \frac{-b}{2a} = \frac{-(-2)}{2(1)} = \frac{2}{2} = 1$ } $y = 1^2 - 2(1) - 6$, $y = 1 - 2 - 6 = -7$ } $(1, -7)$ } $(-\infty, \infty)$ always } $[-7, \infty)$



On Calc
2nd trace
Min
Choose
LB & RB

5. The distance d in meters traveled by a skateboard on a ramp is related to the time traveled t in seconds. This is modeled by the function: $d(t) = 4.9t^2 - 2.3t + 5$. What is the maximum distance the skateboard can travel, and at what time would it achieve this distance? Round your answers to the nearest hundredth. Find vertex

a. 4.73 meters at 0.23 seconds
b. 5.00 meters in 0 seconds
c. 0.23 meters at 4.73 seconds
d. 5.00 meters at .47 seconds

$x = \frac{-b}{2a} = \frac{-(-2.3)}{2(4.9)} = \frac{2.3}{9.8} \sim .23$ } $y = 4.9(0.23)^2 - 2.3(0.23) + 5$, $y = 4.73$ $\boxed{d(t) = 4.73}$

6. Teresa is running a chemical reaction that can be modeled by a quadratic function. When she begins the reaction there are 20 grams of sodium chloride present. At 2 minutes there are 48 grams of sodium chloride. At 5 minutes there are 60 grams of sodium chloride, and at 8 minutes there are 36 grams of sodium chloride. Write a quadratic function that models her data. Use the function to find the point at which all of the sodium chloride will be used up in the reaction. (Hint: Start by making a table of values.) $y = 0$, $x = 10$ min.

In 10 min, All Na will be used

Time (minutes)	Amount (grams)
0	20
2	48
5	60
8	36

Quadratic Regression

1) STAT Edit Enter
2) Fill in L_1 & L_2
3) STAT → Calc → # 5 Enter

$\boxed{y = -2x^2 + 18x + 20}$

All Na used so $y = 0$

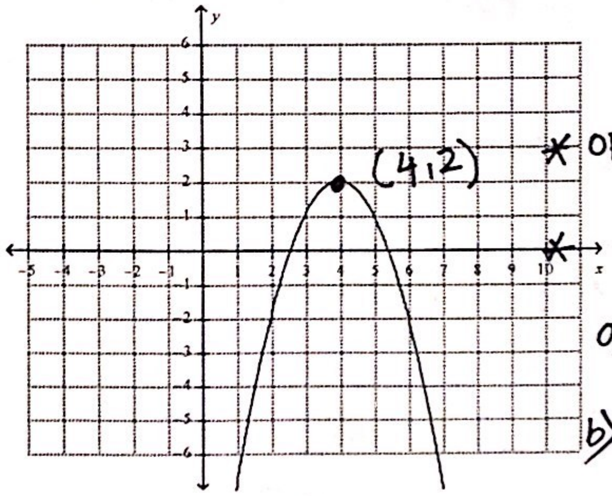
$-2x^2 + 18x + 20 = 0$

$-2(x^2 - 9x - 10) = 0$

$-10 \cdot 1 = -10$
$-10 + 1 = -9$

$(x - 10)(x + 1)$ $x = 10$, $x = -1$

7. Which quadratic function does the graph represent?



* opens down = a is negative

* y -int is negative

a) $x = \frac{-b}{2a} = \frac{-8}{2(-1)} = \frac{-8}{-2} = 4$ ✓

b) $x = \frac{-b}{2a} = \frac{-(-8)}{2(-1)} = \frac{8}{-2} = -4$ X

a. $f(x) = -x^2 + 8x - 14$

~~b.~~ $f(x) = -x^2 - 8x - 14$

vertex not right

~~c.~~ $f(x) = -x^2 + 8x \boxed{+ 14}$ can't be positive

~~d.~~ $f(x) = x^2 + 8x - 14$

↑ a is positive

8. Find the roots of the equation $30x - 45 = 5x^2$ by factoring. $5x^2 - 30x + 45 = 0$

a. $x = -9$

b. $x = 3$

c. $x = 9$

d. $x = -3$

1st step write in standard form.

Complete work is shown later.

9. Write a quadratic function in standard form with zeros 6 and –8.

a. $f(x) = x^2 + 2x - 48$

b. $f(x) = x^2 - 2x - 48$

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

d. $0 = x^2 + 2x - 48$

Zero: 6 Factor $(x-6)$

Zero: -8 Factor $(x+8)$

Complete work is shown later.

10. Solve the equation $x^2 - 10x + 25 = 54$.

a. $x = 5 - 3\sqrt{6}$

b. $x = 5 \pm 6\sqrt{3}$

c. $x = 5 \pm 3\sqrt{6}$

d. $x = 5 + 3\sqrt{6}$

$x^2 - 10x + 25 - 54 = 0$

$x^2 - 10x - 29 = 0$

work shown Later.

11. In order to solve the equation $x^2 = 24 - 2x$ by "completing the square," what quantity would have to be added to both sides of the equation to form a perfect square on the left side of the equation?

a. 2

b. 1

c. - 1

d. - 2

$x^2 + 2x - 24 = 0$

$(x^2 + 2x \boxed{+1}) - 24 \quad -1$

$1 \rightarrow 1$

Add 1

12. Write the function $f(x) = -5x^2 - 60x - 181$ in vertex form, and identify its vertex.

a. $f(x) = -5(x + 12)^2 - 181$;
vertex: (–12, –181)

b. $f(x) = (x + 12)^2 - 181$;
vertex: (–12, –181)

c. $f(x) = (x + 6)^2 - 1$;
vertex: (–6, –1)

d. $f(x) = -5(x + 6)^2 - 1$;
vertex: (–6, –1)

$(-5x^2 - 60x \quad) - 181$

$-5(x^2 + 12x + 36) - 181 + 180$

$6 \rightarrow 36$

Vertex (-6, -1)

$\boxed{-5(x+6)^2 - 1}$

#8

$5x^2 - 30x + 45 = 0$

$5(x^2 - 6x + 9) = 0$

$\underline{-3} \cdot \underline{-3} = 9$

$\underline{-3} + \underline{-3} = -6$

Factor

$\downarrow$

$5(x-3)(x-3) = 0$

$x - 3 = 0$

$\boxed{x = 3}$ Roots

#9

$(x-6)(x+8) = x(x+8) - 6(x+8)$

$= \underbrace{x^2 + 8x - 6x}\ - 48$

$= x^2 + 2x - 48$

#10

Solve using completing the square

$x^2 - 10x - 29$

$(x^2 - 10x + 25) - 29 - 25$

$-5 \rightarrow 25$

$(x-5)^2 - 54 = 0$

$+54 \qquad +54$

$\sqrt{(x-5)^2} = \sqrt{54}$

$x - 5 = \pm\sqrt{54}$

$x = 5 \pm \sqrt{54}$

54: 2, 27; 27: 9, 3; 9: $\cancel{3}$, $\cancel{3}$

$\boxed{x = 5 \pm 3\sqrt{6}}$

Solve using Quad Formula

$x^2 - 10x - 29$

$a = 1$

$b = -10$

$c = -29$

step1

$b^2 - 4ac = (-10)^2 - 4(1)(-29)$

$= 100 + 116 = 216$

step2

$\sqrt{216}$: 216: $\cancel{2}$, 108; 108: $\cancel{2}$, 54; 54: 2, 27; 27: $\cancel{3}$, 9; 9: $\cancel{3}$, 3

$\sqrt{216} = 6\sqrt{6}$

step3

$x = \dfrac{-b \pm 6\sqrt{6}}{2a}$

$x = \dfrac{-(-10) \pm 6\sqrt{6}}{2(1)} = \dfrac{\cancel{10}^{5} \pm \cancel{6}^{3}\sqrt{6}}{\cancel{2}_{1}}$

$\boxed{x = 5 \pm 3\sqrt{6}}$

13. Convert the following equations to vertex form:

$y = x^2 + 3x + 6 = \boxed{(x+\frac{3}{2})^2 + \frac{15}{4}}$

$(x^2+3x+\frac{9}{4})+6-\frac{9}{4}$

$\frac{3}{2} \to \frac{9}{4}$

$y = x^2 + 16x - 7$

$(x^2+16x+64) - 7 - 64$

$8 \to 64$

$\boxed{y=(x+8)^2 - 71}$

14. Express $8\sqrt{-84}$ in terms of i.

a. $\sqrt{-5376}$
b. $16i\sqrt{21}$
c. $-16i\sqrt{21}$
d. $-16\sqrt{21}$

$8\sqrt{-84} = 8i\sqrt{84}$
$= \pm 16i\sqrt{21}$

84 → 2, 42 → 2, 21 → 3, 7

$\sqrt{84} = 2\sqrt{21}$

Both B & C are correct :)

15. Solve the equation $2x^2 + 18 = 0$.

a. $x = \pm 3i$
b. $x = \pm 3$
c. $x = 3 \pm i$
d. $x = \pm 3 + i$

$2x^2+18=0$

$\frac{2x^2}{2} = \frac{-18}{2}$

$x^2 = -9 \to \sqrt{x^2} = \sqrt{-9} \to x = i\sqrt{9} = \boxed{\pm 3i}$

16. Find the zeros of the function $f(x) = x^2 + 6x + 18$. (Solve by completing the square)

a. $x = -3 + 3i$ or $-3 - 3i$
b. $x = -6 + 3i$ or $-6 - 3i$
c. $x = 3i$ or $-3i$
d. $x = -3 + 3i$

$(x^2+6x+9)+18-9=0 \to (x+3)^2+9=0$
$3 \to 9$
$(x+3)^2 = -9 \to \sqrt{(x+3)^2} = \sqrt{-9}$
$x+3 = \pm 3i \to \boxed{x=-3\pm 3i}$

17. Find the zeros of $g(x) = 4x^2 - x + 5$ by using the Quadratic Formula.

a. $x = \frac{1}{8} \pm \frac{\sqrt{81}}{8}i$
b. $x = \frac{1}{8} \pm \frac{79}{8}i$
c. $x = \frac{1}{2} \pm \frac{\sqrt{79}}{2}i$
d. $x = \frac{1}{8} \pm \frac{\sqrt{79}}{8}i$

$a=4 \quad b=-1$
$c=5$

$x = \frac{-(-1) \pm i\sqrt{79}}{8}$

$b^2-4ac = (-1)^2-4(4)(5) = 1-80 = -79$

$\sqrt{-79} = i\sqrt{79}$

$\boxed{x = \frac{1}{8} \pm \frac{i\sqrt{79}}{8}}$

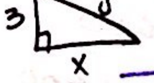
18. Find the number and type of solutions for $x^2 - 9x = -8$.

a. The equation has two real solutions.
b. Cannot determine without graphing.
c. The equation has one real solution.
d. The equation has two nonreal complex solutions.

$x^2-9x+8=0$ only find discriminant

$b^2-4ac = (-9)^2-4(1)(8)$
$= 81-48 = 33$
positive

19. The perimeter of a right triangle is 12 ft, and one of its legs measures 3 ft. Find the length of the other leg and the hypotenuse.



a. 1 ft, 8 ft
b. 3 ft, 6 ft
c. 4 ft, 5 ft
d. 2 ft, 7 ft

$y^2 = 3^2 + x^2 \to \boxed{y^2 = x^2+9}$

$x+3+y=12$
$\boxed{y=-x+9}$
$\boxed{x=9-y}$

$y^2 = (9-y)^2+9$
$\cancel{y^2} = 81-18y+\cancel{y^2}+9$
$0 = 90-18y$
$\frac{18y}{18} = \frac{90}{18}$
$\boxed{y=5 \quad x=4}$

20. Solve the inequality $x^2 + x - 6 \geq -4$.

a. $-2 \leq x \leq 1$
b. $x \leq -2$ or $x \geq 1$
c. $-3 \leq x \leq 2$
d. $x \leq -3$ or $x \geq 2$

Complete work is shown later.

21. The daily profit P that a bakery makes can be modeled by the function $P(x) = -15x^2 + 330x - 815$. (Note that profit does not increase linearly with price because a higher price usually means fewer total pizzas sold.) What must be the price of each loaf of bread to provide a daily profit of at least \$600? (Round your answer to the nearest dollar.)

means \$600 or more

a. $x \leq 16$
b. $x \leq 6$ or $16 \leq x$
c. $6 \leq x$
d. $6 \leq x \leq 16$

$-15x^2+330x-815 \geq 600$

20.

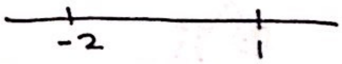
$x^2+x-6 \geq -4$

$x^2+x-6+4 \geq 0$

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

$\underline{2} \cdot \underline{-1} = -2$ $\qquad (x+2)(x-1) \geq 0$

$\underline{2} + \underline{-1} = 1$



step1 : Find Roots

step2 : Pick a point between -2 & 1
For example 0.

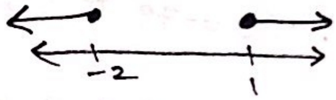
step3 : Plug it in the Inequality.

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

$0^2+0-2 \geq 0$

$-2 \geq 0$ False

step4 : Solution



$(-\infty, -2] \cup [1, \infty)$

$x \leq -2$ or $x \geq 1$

#21

$-15x^2+330x-815 \geq 600$

y_1: $-15x^2+330x-815$

y_2: 600

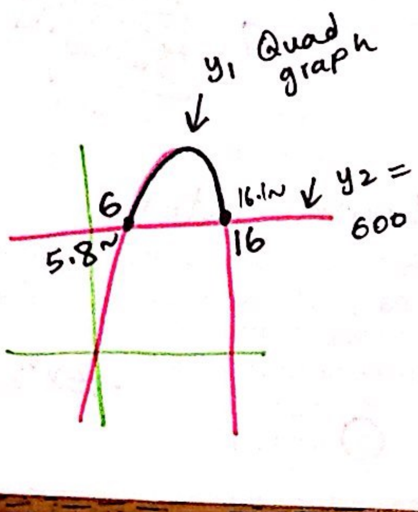
Fix Window

Xmin = -10

Xmax = 50

Ymin = -10

Ymax = 1000



* You're intersested in part of graph above 600

$-15x^2+330x-815 \geq 600$

2nd Trace #5

To find the 2 points of Intersection:

$6 \leq x \leq 16$

22. Determine whether the data set could represent a quadratic function. Explain.

x	–8	–4	0	4	8
y	5	11	14	14	11

Work shown Later.

a. The first differences between y-values are constant for equally spaced x-values, so it could represent a quadratic function.
b. The x-values are not evenly spaced, so this could not be a quadratic function.
c. The 2nd differences between y-values are constant for equally spaced x-values, so it could represent a quadratic function.
d. The 2nd differences between y-values are not constant, so this could not be a quadratic function.

23. Subtract.
$(9 + 2i) - (8 + i)$
a. $1 + i$
b. $8 - 6i$
c. $17 + 3i$
d. $7 + 7i$

step1 Distribute the neg.
$9 + 2i - 8 - i$
step2 Combine like terms
$\boxed{1 + i}$

24. Multiply $6i(4 - 6i)$. Write the result in the form $a + bi$.
a. $-36 - 24i$
b. $36 + 24i$
c. $-36 + 24i$
d. $36 - 24i$

$24i - 36i^2$ $\boxed{i^2 = -1}$
$24i - 36(-1)$
$\boxed{24i + 36}$

25. What expression is equivalent to $(3 - 2i)^2$?
a. 13
b. $13 - 12i$
c. $9 + 4i$
d. $5 - 12i$

$(3-2i)(3-2i)$
$3(3-2i) - 2i(3-2i)$
$9 - 6i - 6i + 4i^2$
$9 - 12i - 4 = \boxed{5 - 12i}$

26. Write the following equations in standard form

$y = (2x - 3)^2$ Foil
$(2x-3)(2x-3)$
$\boxed{4x^2 - 12x + 9}$

$y = -2(x - 3)^2 + 2$
step1: $(x-3)^2 = (x-3)(x-3) = x^2 - 6x + 9$
step2: $-2(x^2 - 6x + 9) + 2$
$-2x^2 + 12x - 18 + 2 = \boxed{-2x^2 + 12x - 16}$

27. Two snow resorts offers private lessons to their customers. Big Time Ski Mountain charges \$5 per hour plus \$50 insurance. Powder Hills charges \$30 per hour plus \$10 insurance. For what number of hours is the cost of lessons the same for each resort?
a 3 hours
4 hours
c. 5 hours
d. 6 hours

let x = # hrs
y = Total charge

Big Time: $y = 5x + 50$
Powder Hills: $y = 30x + 10$

cost of lessons the same
$y = y$
$5x + 50 = 30x + 10$
$-5x \qquad -5x$
$50 = 25x + 10$
$-10 \qquad -10$

$\frac{40}{25} = \frac{25x}{25}$
$\boxed{1.6 = x}$ hrs

#22.

x	-8	-4	0	4	8
y	5	11	14	14	11

6   3   0   -3

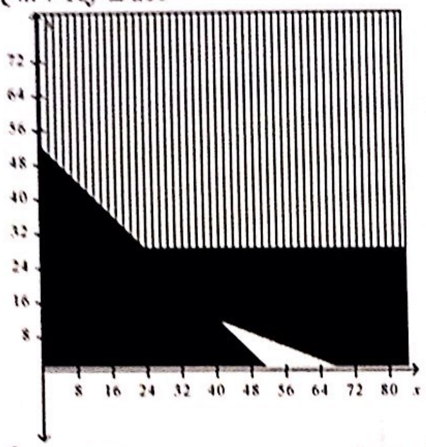
-3   -3   -3 ← 2^{nd} difference is the same.

This table could represent a quadratic Function.

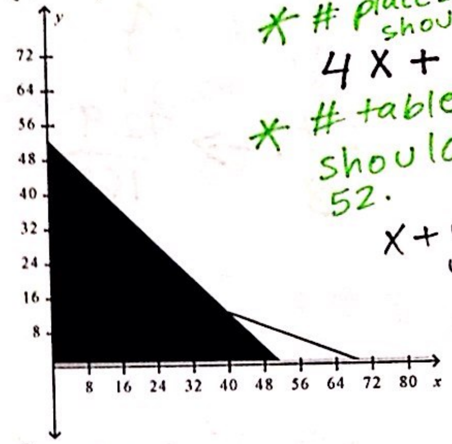
28. Mina's Catering Service is organizing a formal dinner for 280 people. The hall has two kinds of tables, one that seats 4 people and one that seats 10 people. The hall can contain up to a total of 52 tables. Write and graph a system of inequalities that can be used to determine the possible combinations of tables that can be used for the event so there are enough seats for all the people.

let $x = $ # of table of 4
$y = $ # of tables of 10
* # places to seat ppl should be at least 280
$4x + 10y \geq 280$
* # tables present should be at most 52.
$x + y \leq 52$

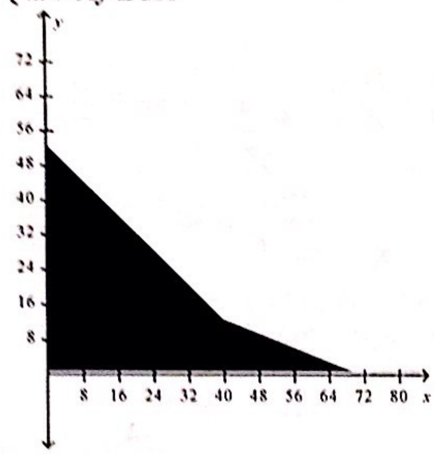
a. $\begin{cases} x + y \leq 52 \\ 4x + 10y \geq 280 \end{cases}$



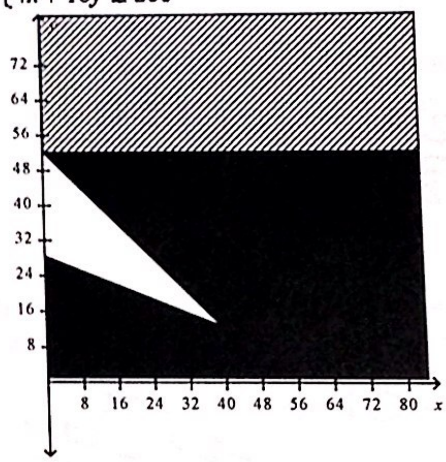
c. $\begin{cases} x + y \leq 52 \\ 4x + 10y = 280 \end{cases}$



b. $\begin{cases} x + y \leq 52 \\ 4x + 10y \leq 280 \end{cases}$



d. $\begin{cases} x + y \geq 52 \\ 4x + 10y \leq 280 \end{cases}$



Numeric Response

29. Find the positive root of the equation $4x^2 + 27x = 40$ by completing the square. Work shown Later.

30. If y is a quadratic function of x, what value completes the table?

x	−4	−2	0	2	4
y	81	49	25	?	1

Find Quad Reg
* STAT Edit Enter
* Fill in L_1 & L_2
* STAT Calc #5

$y = x^2 - 10x + 25$

*
$x = 2$ $y = ?$
$y = (2)^2 - 10(2) + 25$
$\boxed{y = 9}$

#29 $4x^2 + 27x = 40$

$4x^2 + 27x \quad -40 \quad = 0$

$4\left(x^2 + \frac{27}{4}x + \frac{729}{16}\right) - 40 - \frac{729}{16}$

$\frac{27}{8} \rightarrow \frac{729}{16}$

$4\left(x + \frac{27}{8}\right)^2 - \frac{1369}{16} = 0$

$\frac{1}{4} \cdot 4\left(x + \frac{27}{8}\right)^2 = \frac{1369}{16} \cdot \frac{1}{4}$

$\sqrt{\left(x + \frac{27}{8}\right)^2} = \sqrt{\frac{1369}{64}}$

$x + \frac{27}{8} = \pm\frac{37}{8}$

$x = \pm\frac{37}{8} - \frac{27}{8}$

$-\frac{27}{8} - \frac{37}{8}$

$-\frac{27}{8} + \frac{37}{8}$

$\boxed{\frac{10}{8}}$

$\boxed{x = \frac{10}{8} = 1.25}$

31. Determine whether the graph of the following quadratic functions is wider, narrower, or the same width as the parent function $y = x^2$. $|a| > 1$ wider $|a| < 1$ Narrower

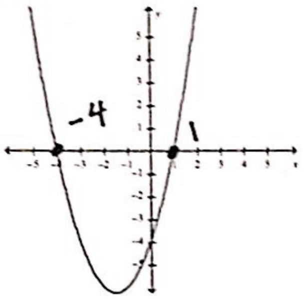
a. $y = 3x^2$
$3 > 1$
wider

b. $y = \frac{1}{4}x^2$
$\frac{1}{4} < 1$
Narrower

c. $y = x^2 - 5$
Same
$a = 1$

d. $y = -2x^2$
$|-2| = 2 > 1$
Wider

32. Determine the roots of the quadratic functions graphed below, then write the quadratic equation in standard form.



Roots : $-4, 1$

Factors : $(x+4)(x-1)$

Standard : $(x+4)(x-1)$

$x^2 - x + 4x - 4$

$\boxed{x^2 + 3x - 4}$

33. The average hourly earnings of US production workers for 1990-1998 are shown in the table below.

	0	1	2	3	4	5	6	7	8
Year	1990	1991	1992	1993	1994	1995	1996	1997	1998
Avg Hourly Earnings	10.19	10.50	10.76	11.03	11.32	11.64	12.03	12.49	13.00

Quad Regression

Using your graphing calculator, find the quadratic regression model for the data and write the quadratic equation. *(HINT: Let x represent the # of years since 1990; round a, b & c to 3 decimal places).*

$y = 0.017x^2 + 0.200x + 10.246$

Using your equation, determine the projected hourly earnings for the year 2008.

year 2008 1990 → 2008 $x = 18$

On Calc.
y_1 = equation

2nd trace #1 Value
(Don't forget to fix window & change Xmax to be higher than 18)

$x = 18$ $y = 19.354$ Avg hourly earnings in 2008

Another Method :

2nd Tableset (window)
Change Auto → Ask for Indpnt.
Then go to table & enter x-value

means the same thing

34. Find the roots/zeros/solutions/x-intercepts of the following functions or equations: $\boxed{\text{Factor}}$

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

$\frac{6}{6} \cdot \frac{-1}{-1} = -6$

$+ \quad = 5$

$(x+6)(x-1)$ Factors

$x+6=0$ $\quad x-1=0$

$\boxed{x=-6}$ $\boxed{x=1}$ Roots

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

Work shown on Back in 3 ways

c. $(5x-2)\left(\frac{1}{2}x+1\right)=0$ Already Factored

$5x-2=0$

$+2 \quad +2$

$\frac{5x}{5}=\frac{2}{5}$ $\quad \boxed{x=\frac{2}{5}}$ 1st Root

$\frac{1}{2}x+1=0$

$-1 \quad -1$

$2 \cdot \frac{1}{2}x=-1 \cdot 2$

$\boxed{x=-2}$

2nd Root

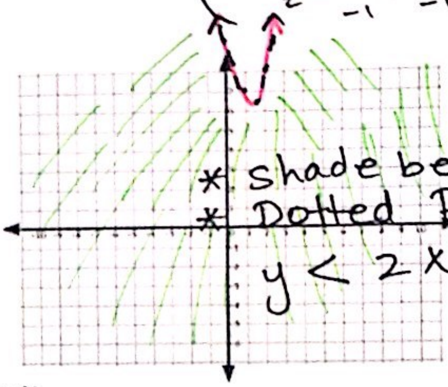
35. Graph the quadratic inequalities:

$y<2x^2-5x+10$

Graph $2x^2-5x+10$

On calc

$y=2x^2-5x+10$



* shade below
* Dotted Parabola

$y<2x^2 - 5x+10$

2nd table

x	y
2	8
1	7
0	10

To find vertex

2nd trace

Min

LB & RB

Vertex $(1.25, 6.875)$

Matrix

36. A homeless shelter used a generous donation to purchase items worth a total of \$2,200. Blankets cost \$5 each, a pair of boots cost \$20 each, and coats cost \$25 each. There are 7 blankets for every coat, and twice as many pairs of boots as coats. Write a matrix equation to find out how many of each item were they able to purchase.

$x=1540$ blankets

$y=440$ pair of boots

$z=220$ coats

x = # blankets

y = # pair of boots

z = # coats

Value equation:

$5x+20y+25z=2200$

Quantity equation:

$x=7z \rightarrow 1x+0y-7z=0$

$y=2z \rightarrow 0x+1y-2z=0$

$$\begin{cases} 5x+20y+25z=2200 \\ 1x+0y-7z=0 \\ 0x+1y-2z=0 \end{cases}$$

$$\begin{bmatrix} 5 & 20 & 25 \\ 1 & 0 & -7 \\ 0 & 1 & -2 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix}=\begin{bmatrix} 2200 \\ 0 \\ 0 \end{bmatrix}$$

Steps on calc:

1) 2nd Matrix, Edit [A] 3x3 enter values

2) 2nd Matrix, Edit [B] 3x1 enter values

3) 2nd Quit, 2nd Matrix, [A], press $\boxed{x^{-1}}$, 2nd matrix [B] enter.

#34 b Factor $3x^2 + 5x - 2$

$a = 3$ $\quad b = 5$ $\quad c = -2$ $\quad ac = -6$

$\underline{6} \cdot \underline{-1} = -6$ Think of 2 #s that multiply to get -6 & add to get 5.

$\underline{6} + \underline{-1} = 5$ On Calc: $y = \frac{ac}{x}$ 2nd table. Find the 2 #s that add to give you "b".

Method 1 — Grouping

$\underbrace{3x^2 + 6x}\ \underbrace{-1x - 2}$

$3x(x+2) - 1(x+2)$

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

Method 2 — Box Method

	x	$+2$
$3x$	$3x^2$	$6x$
-1	$-1x$	-2

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

Method 3 — Short cut

$\frac{\cancel{6}\,2}{\cancel{3}}$ $\quad \frac{-1}{3}$ Divide by a

Simplify if you can

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

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

Once You find Factors, set each factor $=0$ to find roots.

$3x - 1 = 0$
$\quad +1 \quad +1$

$\frac{3x}{3} = \frac{1}{3}$

$\boxed{x = \frac{1}{3}}$

$x + 2 = 0$
$\quad -2 \quad -2$

$\boxed{x = -2}$

$x = \left\{-2, \frac{1}{3}\right\}$