NOTESallANS

Look below for ALL
answers to notes - if you find mistakes, let me know

Date: ____________________ Name: ________________________

Introduction to a Quadratic Function Unit

Big idea

The first half of this course – the first four units – are review of quadratics you've learned in grade 10. If you took grade 10 applied, you will learn a lot of new things in addition to what was done last year. If you took academic course you will find that there is not a lot of new material to learn. Whatever was done before, you must learn to be very proficient with working with quadratic equations as well as learn some new concepts that relate to quadratics you have never seen before. In this unit you will concentrate on the following topics that are outlined in the table below. (The review topics in the table are from BOTH academic and applied course.)

		Success Criteria Assessment as Learning for Learning and of Learning							
I know all the prior concepts related to this unit. (If not STOP & complete more review)	Place a ✓ if you are **confident** in that section. Place a ≈ if you are **just ok** in that section. Leave it blank if you are **lost** in that section. If there are gaps in any row, please see the teacher for extra help in that topic.	I can understand the lesson (If not, ask clarifying questions. Be specific – "what part is unclear?")	I can do a question with an example to follow. (If not, see the teacher for extra help)	I can do questions independently (If not, redo a solved example without looking at solutions)	I can explain/communicate this concept in my own words – JOURNAL (If not, practice explaining steps done in a solved example)	I can apply this concept in other/new contexts/situations (This can be only attained with practice)	I am very confident and am able to complete questions quickly (If not, time yourself to see progress)	I completed the practice in EACH section	I completed the practice test and the review section for this unit.
KU	**Learning Goal**	KU	KU	APP	COMM	TIPS		HW	TEST
Finding equations of and graphing lines, finding equations of and graphing quadratics, simplifying expressions, solving equations, expanding, factoring, problem solving with lines and quadratics	Characteristics of Functions Section 1.1 #2,4,7,10,12,13								P70 - Chapter Self-Test P68-69 Chapter Review Questions
	Lines and Quadratics & Function Notation Section 1.2 #1,2,5,6,8 & EXTRA Handout								
	Working with Function Notation Section 1.3 #3,4,5,6,13,15								
	Transformations of Quadratics – INVESTIGATION with Graphing Calculators Section 1.5 #1,2 i,ii,3,5,6,9,10 & EXTRA Handout								
	Sketching Quadratics using Transformations Section 1.6 #5,7def,10,11 & EXTRA Handout								
	Domain and Range Section 1.7 #2,3,6,7,8,9								
	EXTRA – domain& range activity								

Tentative TEST date_______________

Reflect – TEST mark for this unit___________, Overall mark now___________.

Looking back on this unit, what should you plan to improve upon before the exam?

Corrections for wrong textbook answers:

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Characteristics of Functions

1. Mathematics is a study of relationships. These relationships when written with variables are called **relations**. Sometimes a problem may relate variables that have interdependence. We usually call __x__ variable as independent and the __y__ variable the dependent. The independent variable can also be called the __input__ and dependent variable the __output__. This terminology is often used when the relations are **functions.**

2. What is a function? (Explain using the input/output terminology, as well as explain how to determine if it is a function from an equation and from a graph.)

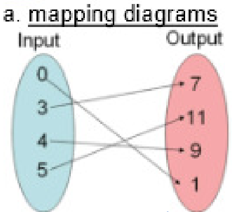
   Functions have only one output (y) for every input (x).
   Graphs pass a vertical line test (touch line only once)
   Equations don't have an even power on output y.

3. Define the terms domain and range.

   Domain is a set of all defined inputs x (Think of shadow on x-axis)
   Range is a set of all resulting outputs from defined inputs
   Symbols: $\{\}$ set of, $\in$ element of, $\mathbb{R}$ - real #'s, $\mathbb{I}$ - integer #'s

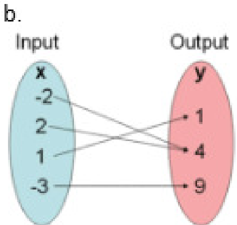
4. Find the domain and range then determine if the following are functions or not.

a. mapping diagrams



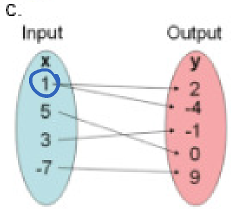
$D = \{0, 3, 4, 5\}$
$R = \{7, 11, 9, 1\}$
Function

b.



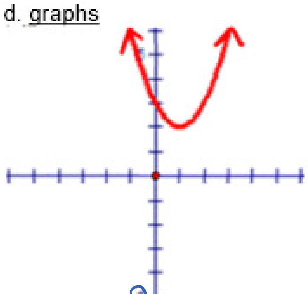
$D = \{-2, 2, 1, -3\}$
$R = \{1, 4, 9\}$
Function

c.



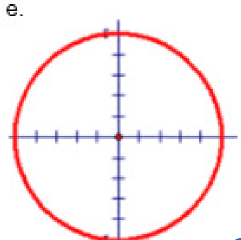
$D = \{x = 1, 5, 3, -7\}$
$R = \{y = 2, -4, -1, 0, 9\}$
Not a function
input $x=1$ has two outputs $y=2$, $y=-4$

d. graphs



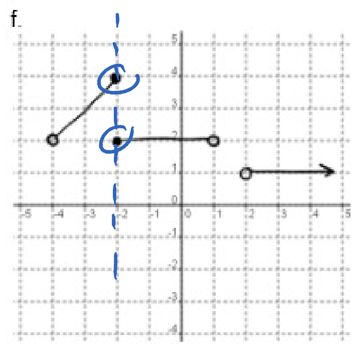
$D = \{x \in \mathbb{R}\}$
$R = \{y \in \mathbb{R}, y \geq 2\}$
Function

e.



$D = \{-5 \leq x \leq 5\}$
$R = \{-5 \leq y \leq 5\}$
Not a function

f.



$D = \{x \in \mathbb{R}, -4 < x < 1, 2 < x\}$
$R = \{y \in \mathbb{R}, y = 1, 2 \leq y \leq 4\}$
Not a function
Doesn't pass vertical line test at $x = -2$

2

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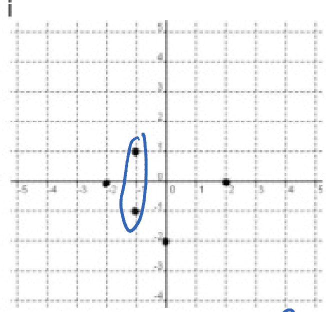
g. points
$\{(-3,9),(-2,8),(-1,2),(-2,-4)\}$

$D=\{-3,-2,-1\}$
$R=\{9,8,2,-4\}$
Not a function

h.
$\{(2,5),(3,5),(4,10),(5,0)\}$

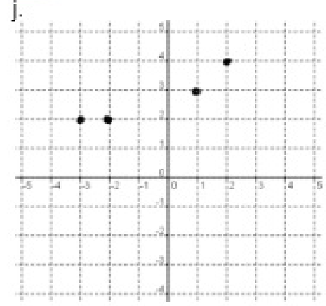
$D=\{2,3,4,5\}$
$R=\{5,10,0\}$
Function

i



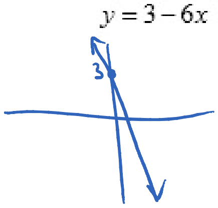
$D=\{-2,-1,0,2\}$
$R=\{-2,-1,0,1\}$
Not a function

j.



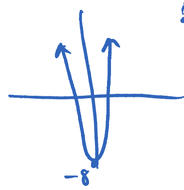
$D=\{x=-3,-2,1,2\}$
$R=\{y=2,3,4\}$
Function.

k. equations
$y=3-6x$



Function
$D=\{x\in R\}$
$R=\{y\in R\}$

l.
$y=2x^2-8$



Function
$D=\{x\in R\}$
$R=\{y\geq -8\}$

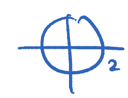
m.
$x^2+y^2=4$

when isolate output get 2 answers!

$y^2=4-x^2$
$y=\pm\sqrt{4-x^2}$

Not a function
$D=\{-2\leq x\leq 2\}$
$R=\{-2\leq y\leq 2\}$

Circle
$r=2$



n. descriptions
A vending machine produces pop, gum, chocolate bars, etc. depending on the button pressed.

Function
$D=\{$button pressed$\}$
$R=\{$item$\}$

o.
The postal office looks at the postal code on the package to decide which address it goes to.

Not a function
Code → Apt #1
Code → Apt #2

$D=\{$code$\}$
$R=\{$all addresses in that region$\}$

p.
The forensic office analyzing DNA, is trying to determine the identity of a person it belongs to.

DNA → twin #1
DNA → twin #2
if identical
(fingerprints are different)
Not a function if twins are analyzed
(otherwise it is.)
$D=\{$DNA$\}$
$R=\{$person's identity$\}$

For which pair of related quantities would time be the independent variable?

a. grade, time spent on project
b. length of race, finish time
c. flight time, rainfall
d. distance to work, commute time

A - control the time spent on project

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Lines and Quadratics & Function Notation

1. What is **function notation**?

name → $f(x)$ ← input
output

instead of output y write $f(x)$

2. What could function notation be confused with?

Brackets in function notation do NOT mean to multiply

3. You have seen function notation for specific functions, but you just didn't know it. Indicate what is the name of the function, the input and the output of each of the following
   a. $\cos(\theta)$.
   name = cosine
   input = θ angle
   output = $\cos\theta$ ratio
   b. $\sin^{-1}(0.5)$
   name = inverse sine
   input = 0.5 ratio
   output = $\sin^{-1}(0.5) = 30°$ angle
   c. $\sqrt[3]{(9)}$
   name = cube root
   input = 9
   output = $\sqrt[3]{9} \sim 2.08$
   d. $(2x)^2$
   name = squared
   input = $2x$
   output = $(2x)^2 = 4x^2$

4. Explain why it is incorrect to write the following, give corrected versions.
   a. $\cos = \frac{1}{2}$
   no input written
   "cos" is meaningless without input
   b.
   $\tan x = 0.5234$
   $x = 0.5234\tan^{-1}$
   name in front of input
   not multiplications

5. What do differences of the dependent variable tell you about the relation given?

If 1st differences are the same → Linear
If 2nd differences are the same → Quadratic
* x values must go up by the same interval otherwise it won't work

6. Determine what type of functions are these? Specify what variable is the function of what other variable and record the output in function notation.

a.

x	y
0	-9
2	-10
4	-7
6	0
8	11
10	26

-1, +3, +7, +11, +15
+4, +4, +4, +4
not linear
∴ quadratic
y is a function of x
$y(x)$

b.

n	P
1	-8
7	2
13	12
19	22
~~22~~	~~27~~
25	32

+10, +10, +10, ignore, +10
not up by 6 on x's
∴ linear
P is a function of n
$P(n)$

c.

Time (years)	Radiation level
1	17
2	9
3	5
4	3
5	2
6	1.5

-8, -4, -2, -1, -0.5
+4, +2, +1, +0.5
not linear
not quadratic
∴ neither
Radiation is a function of time
$R(t)$

d.

Length	Area of figure
1	2
2	5
3	10
4	17
5	26
6	37

+3, +5, +7, +9, +11
2, 2, 2, 2
∴ quad
Area is a function of Length
$A(l)$

e.

# of items	Cost
10	7
12	9
14	11
16	13
18	15
20	17

+2, +2, +2, +2, +2
∴ linear
Cost is a function of items
$C(i)$

4

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7. What is a degree of a function? How does it help you determine what type of function is given?

Degree is the highest power of a term
Linear functions have degree ONE (ie. no exponents)
Quad. functions have degree TWO (ie. x^2

8. Decide what type of function is given by expanding and simplifying then determining the degree of the function.

a. expand to see

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

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

$=-x^2-x+6$

quadratic

b. $g(x)=5+4(x-2)-8x$

$=5+4x-8-8x$

linear

c. $h(x)=2x-(x-2)^2$

$=2x-(x-2)(x-2)$

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

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

$=-x^2+6x-4$

quad

d. $i(x)=3+x-5(x-7(x+1))$

$=3+x-5x+35(x+1)$

$=3-4x+35x+35$

$=31x+38$

linear

9. The helium balloon is launched from a height of 2 meters and it rises at a rate of 0.5 m/s.

a. Write an equation in function notation for the height, h, of the balloon at time, t, seconds.

rate of change = m

initial value = b

$y=mx+b$

$y=0.5x+2$ $\therefore h(t)=0.5t+2$

b. What is the domain and range of this function, assuming that the balloon pops at a height of 1 km.

sub $h=1000$

$1000=0.5t+2$

$998=0.5t$

$1996\text{sec}=t$

$D=\{0\le t\le 1996\}$

$R=\{2\le h\le 1000\}$

10. Video games cost on average \$8.00 to rent. The player costs \$300. The total cost of playing video games can be represented by a function C(v).

per game = m initial value = b

a. Write an equation in function notation for the cost of v, video games.

$y=mx+b$

$C(v)=8.00v+300$

b. State the degree of this function and whether it is linear or quadratic.

degree = 1 linear

c. Use your equation to calculate the cost of renting 20 video games.

$C(20)=8(20)+300$

$=160+300$

$=\$460$

d. What is the domain and range of this function, assuming that you have \$780 to spend?

$D=\{0\le v\le 60\}$

$R=\{300\le C\le 780\}$

$780=8v+300$

$480=8v$

$60=v$

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11. A skydiver's height is modelled by $h(t) = 2000 - 4.9t^2$ for $\{t \in R, 0 \le t \le 14\}$, where t is the time elapsed, in seconds, and h is the height in meters. After 14 seconds the skydiver opens up the parachute and his descent is modelled by $h(t) = 1039.6 - 3.5(t - 14)$.

a. Use the degrees to determine what type of relations the equations are.

1st degree = 2 quadratic
2nd degree = 1 linear

b. At what height was the parachute released?

sub $t = 14$ $h(14) = 2000 - 4.9(14)^2$
$= 2000 - 4.9(196)$
$= 2000 - 960.4$
$= 1039.6$ m high

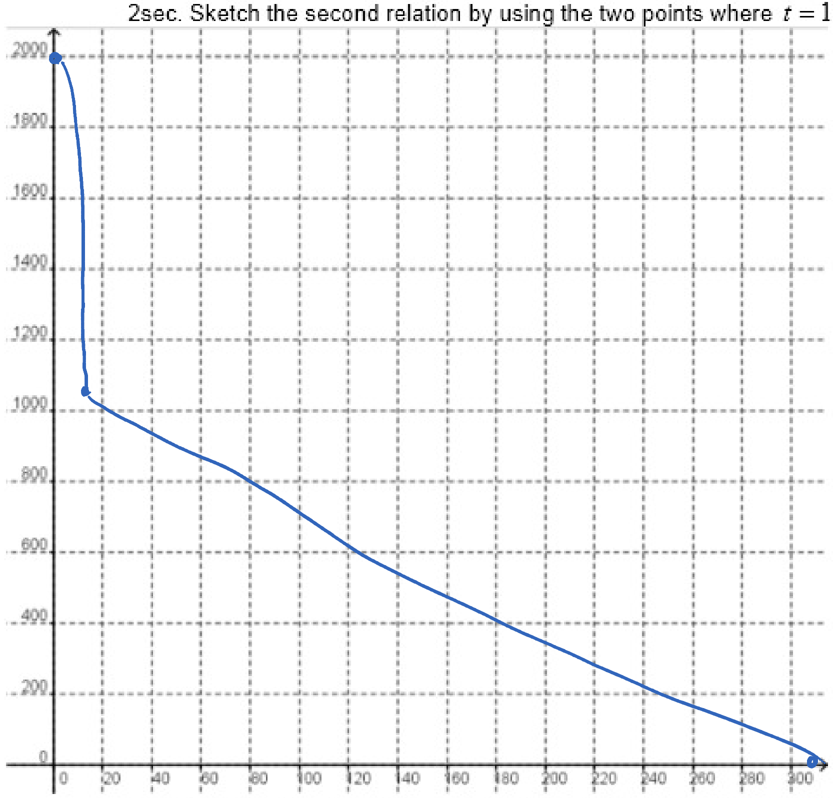
can use any equation

c. At what time did the skydiver land on the ground?

use 2nd equation $0 = 1039.6 - 3.5(t - 14)$
$-1039.6 = -3.5(t-14)$
$297.03 \doteq t - 14$
$311.03 \doteq t$

land in 311 seconds
~ 5 min

d. Sketch the first relation on the domain of $\{t \in R, 0 \le t \le 14\}$ using a table of values with time increments of 2sec. Sketch the second relation by using the two points where $t = 14$ and $t =$ answer from c.



t	h	1st differences	2nd differences
0	2000		
2	1980.4	−19.6	−39.2
4	1921.6	−58.8	−39.2
6	1823.6	−98	−39.2
8	1686.4	−137.2	−39.2
10	1510	−176.4	
12	1294.4		
14	1039.6		

311 , 0

e. Show that the differences in the table for the first relation match with your answer about what type of relation it is in question a.

2nd differences are the same
∴ quadratic

f. Use vertical line test to determine if the relation is a function.

It is a function
made from 2 pieces/graphs.

Date: ______________________ Bring colouring pencils to next class Name: ___________________________

Function Notation

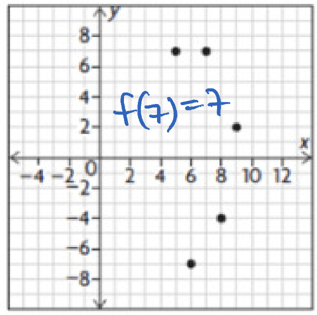
1. Determine $f(7)$ of each of the following

$f = \{(-9, 7), (-7, 6), (0, -7), (7, -9), (9, 7)\}$

$f(7) = -9$

x	0	1	3	5	7
f(x)	−7	−5	−3	−1	0

$f(7) = 0$



$f(7) = 7$

Is the this graph a function? Explain.

Yes since it passes vertical line test or for every input there's only one output

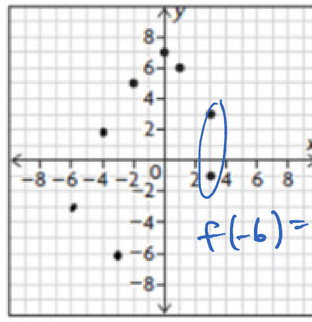
2. Determine $f(-6)$ of each of the following

$f = \{(-10, -6), (-9, -7), (-8, -8), (-7, -9), (-6, -10)\}$

$f(-6) = -10$

x	−6	−4	−2	0	2
f(x)	−6	−6	−6	−6	−6

$f(-6) = -6$



$f(-6) = -3$

Is the this graph a function? Explain.

Not a function doesn't pass the vertical line test

3. For the following function determine $f(-2), f(0), f(3), f(4x)$

$f(x) = x^2 + 7x + 12$

$f(-2) = (-2)^2 + 7(-2) + 12$
$= 4 - 14 + 12$
$= 2$

$f(0) = 0^2 + 7(0) + 12$
$= 12$

$f(3) = 3^2 + 7(3) + 12$
$= 9 + 21 + 12$
$= 42$

$f(4x) = (4x)^2 + 7(4x) + 12$
$= 16x^2 + 28x + 12$

4. For the following function determine $f(0), f(-1), f(2), f(5x)$

$f(x) = 7x^2 - 25x + 12$

$f(0) = 7(0)^2 - 25(0) + 12$
$= 12$

$f(-1) = 7(-1)^2 - 25(-1) + 12$
$= 7(1) + 25 + 12$
$= 44$

$f(2) = 7(2)^2 - 25(2) + 12$
$= 7(4) - 50 + 12$
$= -10$

$f(5x) = 7(5x)^2 - 25(5x) + 12$
$= 7(25x^2) - 125x + 12$
$= 175x^2 - 125x + 12$

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5. Three consecutive even integers numbers are picked from the domain $-10 \le x \le 10$. The equation that models the sum of their squares is $S(x) = x^2 + (x+2)^2 + (x+4)^2$

a. What does each part of the equation represent?

$S(x)$ = sum x, $x+2$, $x+4$ are the 3 consecutive even #'s.

b. Evaluate $S(-10)$, what does it represent?

$S(-10) = (-10)^2 + (-8)^2 + (-6)^2 = 100 + 64 + 36 = 200$ sum of 3 consecutive even squares from −10

c. Evaluate the function for all valid values of the domain. Organize results in a table.

x	−10	−9	−8	−7	−6	−5	−4	−3	−2	−1	0	
S	200	155	116	83	56	35	20	11	8	11	20	....

repeats

d. Find which three numbers would give the minimum sum?

$x = -2$ ∴ the 3 numbers are −2, 0, 2 that give a Minimum Sum

6. A pebble falls straight to the ground from a cliff that is 1102.5 m tall. The function representing the distance the pebble has fallen in meters is $d(t) = 4.9t^2$, where t is the time the pebble has been falling in seconds.

a. Evaluate $d(3)$. What does it represent?

$d(3) = 4.9(3)^2 = 4.9(9) = 44.1$ at time 3sec distance fallen is 44.1 m

b. Explain what does the following tell you? $d(5) = 122.5$

After 5 sec pebble fell 122.5 m

c. When did the pebble land on the ground?

$1102.5 = 4.9t^2$

$225 = t^2$

$15 = t$ ∴ in 15 sec lands on ground

d. What is the domain and range of this situation?

$D = \{0 \le t \le 15, t \in \mathbb{R}\}$

$R = \{0 \le d \le 1102.5, d \in \mathbb{R}\}$

7. a) Explain what each part of the following tells you $m(p) = p^2 + p$

b) Evaluate and simplify the expression for $m(1-x)$

m = name

p = input

m(p) = output calculated by input squared plus input

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

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

$= 2 - 3x + x^2$

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Transformations of Quadratics - INVESTIGATION

In this investigation you will graph different parabolas and determine the link between the equation in "vertex form" $y=a(x-h)^2+k$ and the transformations from the basic parabola $y = x^2$

TECHNOLOGY OPTION
To help you graph and plot the parabolas, enter the equation in the $\boxed{Y=}$

Use $\boxed{X, T, \theta, n}$ to type a variable

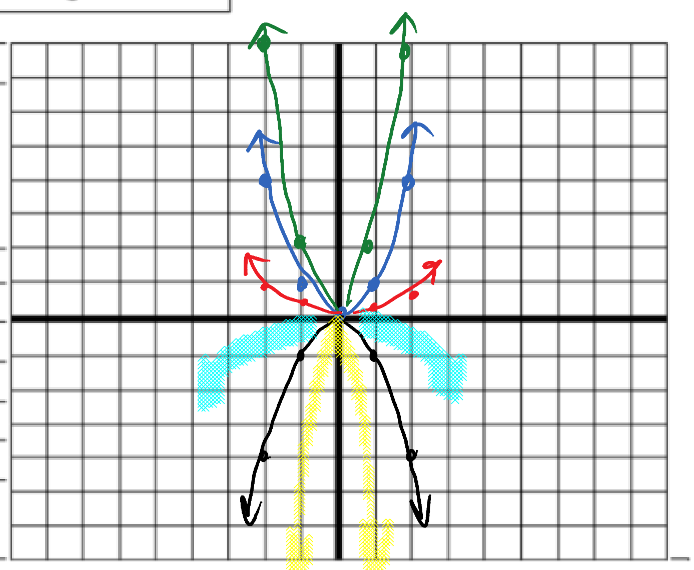
Remember to use GREY $\boxed{(-)}$ when negative appears FIRST and BLUE $\boxed{-}$ otherwise

Press $\boxed{\text{graph}}$ to see the graph

Press $\boxed{2^{nd}}$ $\boxed{\text{graph}}$ to see a table of values for the parabola

Parabola Investigation #1

Basic Equation	$y = x^2$ m	
Vertex Form $y = a(x-h)^2+k$ Change values for a keep h=0 and k=0 for now		
values	Equations	Colour
a=2	$y=2x^2$	m
a=0.2	$y=0.2x^2$	m
a=-1	$y=-x^2$	m
a=-2	$y=-2x^2$	
a=-0.2	$y=-0.2x^2$	



Summarize what effect does a have on the graph of $y = x^2$

If a is negative → reflects graph in x-axis
If a is bigger than 1 or less than −1 → vertical stretch
If a is between −1 and 1 → vertical compress

1. State the transformations performed on $y = x^2$ in each of the following quadratics

a. $y = 1/3x^2$

vertical compression

b. $y = -5x^2$

reflect
vertical stretch

c. $y = -0.001x^2$

reflect
vertical compress

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Parabola Investigation #2

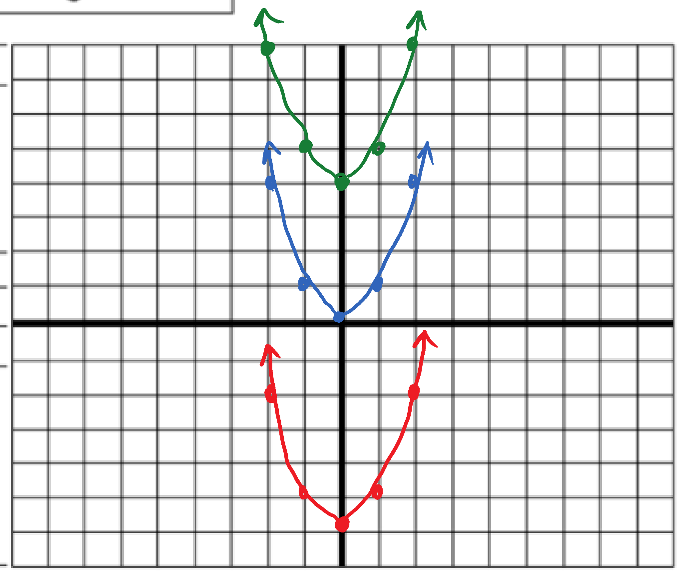
Basic Equation	$y = x^2$ m
Vertex Form $y = a(x - h)^2 + k$ Change values for **k** keep a=1 and h=0 for now	

values	Equations	Colour
k=4	$y = 1(x-0)^2 + 4 = x^2 + 4$	m
k=-6	$y = x^2 - 6$	m

What effect does changing *k* have on the graph of $y = x^2$?

K pos. shift up

K neg. shift down



2. State the transformations performed on $y = x^2$ in each of the following quadratics

a. $y = 2x^2 - 9$

a= 2 vert. stretch

K= -9 shift down

b. $y = -0.5x^2 - 16$

a=-0.5 {reflect, vert. comp}

K=-16 shift down

c. $y = -3x^2 + 9$

a=-3 reflect, vert stretch

K=9 shift up

Parabola Investigation #3

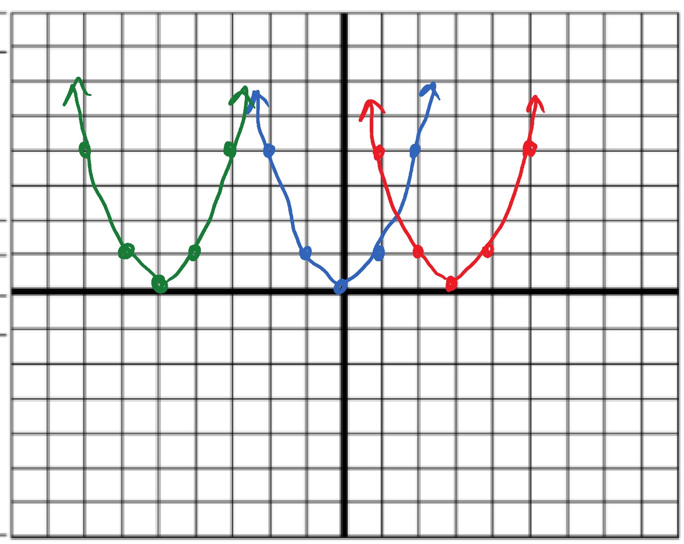
Basic Equation	$y = x^2$ m
Vertex Form $y = a(x - h)^2 + k$ Change values for **h** keep a=1 and k=0 for now	

values	Equations	Colour
h=3	$y = 1(x-3)^2 + 0 = (x-3)^2$	m
h=-5	$y = (x+5)^2$	m

What effect does changing *h* have on the graph of $y = x^2$

h pos. (in bracket neg) shift right

h neg. shift left



3. State the transformations performed on $y = x^2$ in each of the following quadratics

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

left 2

b. $y = (x - 4)^2 - 7$

right 4
down 7

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

reflect in x-axis
left 4
up 3

d. $y = 2(x - 1)^2$

vert. stretch
right 1

Bring colouring pencils to next class

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Sketching Quadratics using Transformations

1. Summarize what the letters of $y = a(x-h)^2 + k$ stand for. Make a note on the order that transformations should be applied in.

a → neg = reflect in x-axis
→ vertical stretch or compression
ex. $a = 2$ or -2 $a = \frac{1}{2}$ or $-\frac{1}{2}$ ...

h → shift left/right (* switch sign for h)

k → shift up down

ORDER

x	y=parent	x	$y \cdot a$	$x \pm h$	$y \pm k$

2. Write an equation of a parabola that satisfies each set of conditions

a. Opens down, congruent with $y = \frac{1}{4}x^2$, vertex $(5,-4)$

h k

a = neg

same shape

$\therefore a = -\frac{1}{4}$

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

b. Vertex $(-3,-8)$, x-intercepts of 1 and – 7.

h k

$y = a(x+3)^2 - 8$ sub pt $(1,0)$ or $(-7,0)$

$0 = a(1+3)^2 - 8$

$8 = a(4)^2$

$8 = 16a$

$\frac{1}{2} = a$

$\therefore y = \frac{1}{2}(x+3)^2 - 8$

c. Vertex $(2,7)$, y-intercept – 3. $(0,-3)$

$y = a(x-h)^2 + k$

$-3 = a(0-2)^2 + 7$

$-3 = a(4) + 7$

$-3 = 4a + 7$

$-10 = 4a$

$-\frac{10}{4} = a$

$-\frac{5}{2} = a$

$\therefore y = -\frac{5}{2}(x-2)^2 + 7$

d. Vertex $(0,-4)$, passes through $(-3,2)$

$y = a(x-h)^2 + k$

$2 = a(-3-0)^2 - 4$

$2 = 9a - 4$

$6 = 9a$

$\frac{6}{9} = a$

$\frac{2}{3} = a$

$\therefore y = \frac{2}{3}(x-0)^2 - 4$

or

$\frac{2}{3}x^2 - 4$

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3. Describe the transformations (in the correct order) applied to the graph of $y = x^2$ to obtain the graphs of the following quadratic relations. Sketch the graph by hand. Start with the graph of $y = x^2$ and show all transformations with different colours.

a. $y = -3(x+2)^2 + 8$

$a = -3$ reflect in x-axis, vertical stretch

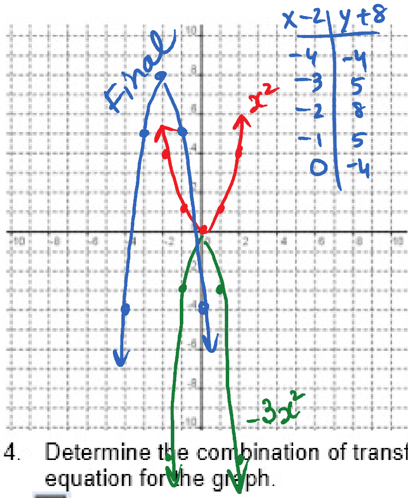
$h = -2$ left

$K = 8$ up

x	y
-2	4
-1	1
0	0
1	1
2	4

x	$y \cdot a$
-2	-12
-1	-3
0	0
1	-3
2	-12

$x-2$	$y+8$
-4	-4
-3	5
-2	8
-1	5
0	-4



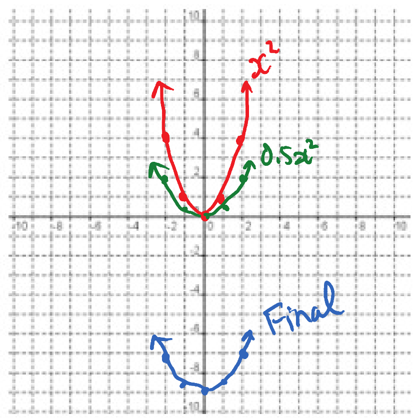
b. $y = 0.5x^2 - 9$

$a = 0.5$ vert. compress

$K = -9$ shift down

x	$y \cdot 0.5$
-2	2
-1	0.5
0	0
1	0.5
2	2

x	$y-9$
-2	-7
-1	-8.5
0	-9
1	-8.5
2	-7



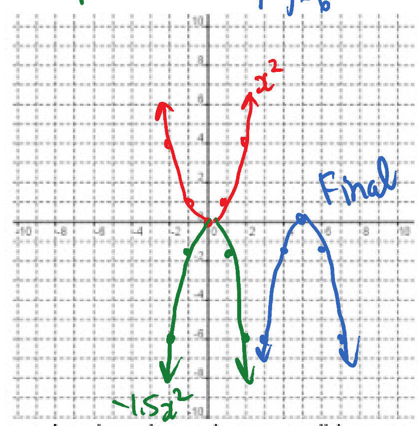
c. $y = -1.5(x-5)^2$

$a = -1.5$ reflect + vert. stretch

$h = 5$ shift right

x	$y \cdot (-1.5)$
-2	-6
-1	-1.5
0	0
1	-1.5
2	-6

$x+5$	y
3	-6
4	-1.5
5	0
6	-1.5
7	-6



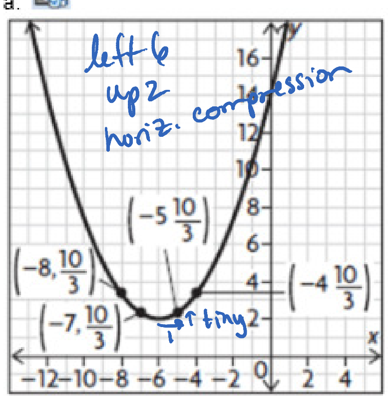
4. Determine the combination of transformations that would result in the following graphs, then determine a possible equation for the graph.

a.

left 6

up 2

horiz. compression



$y = a(x - -6)^2 + 2$ sub $\left(-4, \frac{10}{3}\right)$

$\frac{10}{3} = a(-4+6)^2 + 2$

$\frac{10}{3} - \frac{2}{1} = a(2)^2$

$\frac{10-6}{3} = 4a$

$\frac{4}{3} = 4a$

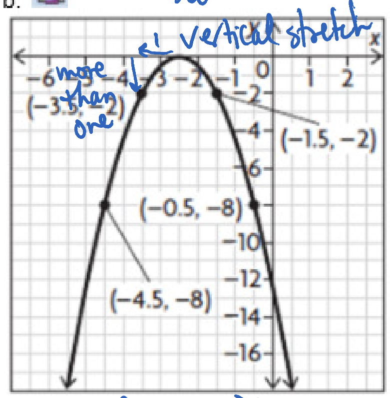
$\frac{1}{3} = a$

$\boxed{y = \frac{1}{2}(x+6)^2 + 2}$

b.

left 2.5

vertical stretch



$y = a(x - -2.5)^2 + 0$ sub $(-1.5, -2)$

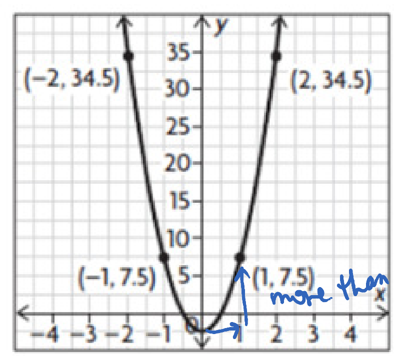
$-2 = a(-1.5+2.5)^2$

$-2 = a$

$\boxed{\therefore y = -2(x+2.5)^2}$

c.

down 2.5



$y = a(x-0)^2 - 2.5$ pt $(1, 7.5)$

$7.5 = a(1)^2 - 2.5$

$10 = a$

$\boxed{\therefore y = 10x^2 - 2.5}$

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Domain and Range

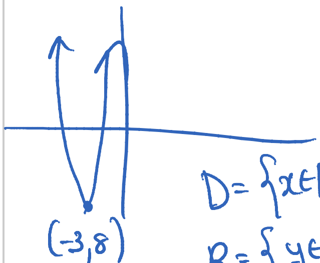
Some of the questions in the textbook require you to graph with technology. There are lots of applets you can use online, or you can download a free program to use on your computer offline.

Online Graphing Calculator
http://my.hrw.com/math06_07/nsmedia/tools/Graph_Calculator/graphCalc.html

Download GeoGebra (offline and online)
http://www.geogebra.org/cms/en/download, select **webstart**, for offline
select **appletstart**, for online

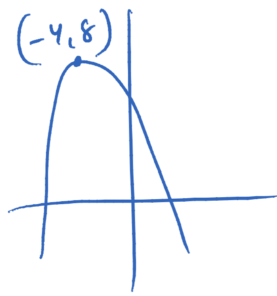
1. Use graphing software to graph each function and then use the graph to state the domain and range.

a. $f(x) = 2(x+3)^2 - 8$



$D = \{x \in \mathbb{R}\}$
$R = \{y \in \mathbb{R},\ y \geq 8\}$

b. $g(x) = 4 - 2x - 0.25x^2$



$D = \{x \in \mathbb{R}\}$
$R = \{y \in \mathbb{R},\ y \leq 8\}$

2. Notice that range is visible from ONE of the versions of quadratic equation above. What must the equation look like for range to be visible and how can you determine the range from it?

To see range the quadratic should be in vertex form. The range is $y \leq k$ if ∩ or $y \geq k$ if ∪

3. What is the domain and range for lines? (make sure you explain all types of possible lines)

sloped line $D = \{x \in \mathbb{R}\}$ $R = \{y \in \mameric\}$

vertical $D = \{x = \#\}$ $R = \{y \in \mathbb{R}\}$

horiz. $D = \{x \in \mathbb{R}\}$ $R = \{y = \#\}$

4. Find the domain and range for each of the following ralations.

show tech

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

$D = \{x \in \mathbb{R}\}$
$R = \{y \in \mathbb{R},\ y \leq 5\}$

b. $g(x) = 5$

$D = \{x \in \mathbb{R}\}$
$R = \{y = 5\}$

c. $x = -6$

$D = \{x = -6\}$
$R = \{y \in \mathbb{R}\}$

d. $h(x) = 4(x+3)^2$

$D = \{x \in \mathbb{R}\}$

e. $f(x) = 7x - 3$

$D = \{x \in \mathbb{R}\}$
$R = \{y \in \mathbb{R}\}$

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

(5, 8)

$D = \{x \in \mathbb{R}\}$
$R = \{y \in \mathbb{R},\ y \leq 8\}$

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

can't see without graphing vertex

(-2.5, 9)

$D = \{x \in \mathbb{R}\}$
$R = \{y \in \mathbb{R},\ y \geq -9\}$

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5. While on vacation, Talisha won a lot of tickets at two arcades on the boardwalk she was visiting. The first arcade charges $1 to cash in and gives you 12 cents back on each ticket won, the second arcade gives you 10 cents back on each ticket and no fee to cash in.

   a. Determine the equations for the money you can leave with as functions of winning tickets for both arcades.

   let W = winnings, t = tickets

   first: $W(t) = 0.12t - 1$

   second: $W(t) = 0.10t$

   b. Determine the domain and range for both arcades.

   for BOTH: $D = \{t \in \mathbb{R},\ t \geq 0\}$ can't have negative # of tickets

   1st $R = \{W \in \mathbb{R},\ W \geq -1\}$

   2nd $R = \{W \in \mathbb{R},\ W \geq 0\}$

6. A rocket is launched and its height in feet as a function of time in seconds is given by $1600t - 16t^2$. Find the domain and range that will make sense in the context of this real life situation. (use a table of values)

t	0	20	40	60	80	100
h	0	25600	38400	38400	25600	0

→ can't go below zero

vertex in middle
$t = 50$
$h = 40\,000$

$D = \{t \in \mathbb{R},\ 0 \leq t \leq 100\}$

$R = \{h \in \mathbb{R},\ 0 \leq h \leq 40\,000\}$

7. Oberon Cell Phone Company advertises servise for 3 cents per minute plus a monthly cost of $29.95.

   slope   y-int

   a. Determine the equation for the cost as a function of minutes.

   $C(m) = 0.03m + 29.95$

   b. Determine the domain and range for this real life situation.

   can't have negative minutes

   $D = \{m \geq 0\}$

   $R = \{c \geq 29.95\}$

8. Two people are playing golf. The height above the ground in meters is given by $h_1(t) = -5t^2 + 40t$ for a person hitting the golf ball from ground level and $h_2(t) = -5t^2 + 40$ for a person hitting the golf ball from a roof of a building.

   a. For which player must you create a table of values to see domain and range? Create it.
   (if you took grade 10 academic course, you may: for the RANGE -complete the square to see vertex, and for the DOMAIN – common factor to see zeros instead of doing the table of values – if you remember how)

   equation #1 not in vertex form – can't see range!

t	0	1	2	3	4	5	6	7	8
h	0	35	60	75	80	75	60	35	0

repeats

   b. Find the domain and range for both players.

   $D_1 = \{t \in \mathbb{R},\ 0 \leq t \leq 8\}$

   $R_1 = \{h \in \mathbb{R},\ 0 \leq h \leq 80\}$

   $D_2 = \{t \in \mathbb{R}\ 0 \leq t \leq 2.8\}$

   $R_2 = \{h \in \mathbb{R},\ 0 \leq h \leq 40\}$

   $0 = -5t^2 + 40$
   $5t^2 = 40$
   $t^2 = 8$
   $t \doteq 2.8$