Journals AP stream

Go out and buy a notebook (or a few) to keep all journal questions separate from the EXTRA practice. Think of the journal as your own set of summary notes. Some of the questions are just to copy down formulas/algorithms as reference. However most of the time journal questions will ask you to explain the process of doing a particular type of question.

Each Journal ENTRY will be DUE the next day before school starts, the pictures of the work are to be inserted into OneNote. Once you receive feedback, you are to make corrections and submit the WHOLE journal the day of the TEST.

OneNote instructions

- Sign into Office 365 from the LaunchPad for Students from www.dcdsb.ca website or http://dcdsb.ca/office365 by using the student email address: studentID@students.dcdsb.ca (example: For John Abbey, abbeyj@students.dcdsb.ca)
- In the Email APP you should get an email from your teacher with a link to OneNote Notebook
- If you are on a device, download the OneNote APP first then when asked to sign in, use the same email and password you used for Office365.
- If you already have been using OneNote APP you need to add another account or connect to another service in settings of the OneNote APP. Select add OneDrive for Business and use the same email and password used in Office365. Then go to open more from OneDrive and find the ClassNotebook name you see in the email sent by your teacher.

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What is the purpose of the journals?

- 15% of your final mark
- it helps you study
- you can use it on the harder part of the exam – the Culminating Task (of MPM and MCR courses have those)
- you can keep it for future math courses as a reference

What I will look for in a Journal

- **It is done?**
- **Did you include examples and explanations?** Use your own (not copied from notes or internet) examples and concise (not long – but with enough detail) explanations. Can use point form. Ask yourself, "A few months from now, if I read this to myself, will I know what's going on?" or "My friend who was absent for this lesson will be caught up with all that's needed to know about this concept just by reading my journal?" In other words, the journal is your "personal textbook". Use a past student's online journal as a resource: http://www.roslynsmathjournal.weebly.com
- **Is it easy to read?** Use SUBTITLES in different colour and number each question, so it is easy to spot what the information is about. Incorporate the question into the answer OR copy questions the questions down before solving it.
- Use all white space of the page, do not waste paper, **write small** (like a cheat sheet) - when you are studying later you'll be grateful to have less pages to look over.

See below for exemplars:

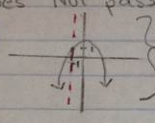
UNIT 1 - functions

1 FUNCTION vs. NON FUNCTIONS

★ Functions must have ONLY one output (y) for every input (x)

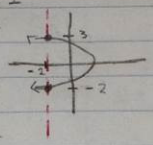
a) Graphs → Non-function if it does NOT pass vertical line test

Ex.



✓ Passes vertical line test (e.g. input $x = -1$ will only produce the output $y = 1$)

✗ Does not pass vertical line test (e.g. input $x = 0$ will produce two outputs of $y = 3$ and $y = -2$)

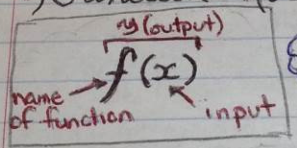


Equations → Non-function if output (y) has an even power

Ex. $x + y^3 = 10$ ✓ Output (y) has an odd exponent (e.g. you will only get one answer for every y-value you plug in: $(2)^3 = 8$, $(-2)^3 = -8$)

✗ Output (y) has an even exponent (e.g. there are 2 possible numbers you can sub for y and get the same answer: $86 = y^4 + x$; $(3)^4 = 81$, $(-3)^4 = 81$ → 81 → 3, -3)

b) Function Notation: can only be used if equation is truly a function:

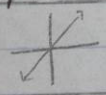
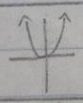
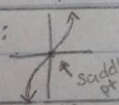
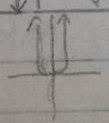


Ex. ✓ $f(x) = x^2 + 9$ • eqn. of a parabola; parabolas ARE functions

✗ $f(x) = x^2 + 4^2$ • eqn. of a circle; circles are NOT functions ∴ cannot represent using f(x)

! DO NOT CONFUSE BRACKET AS INDICATION TO MULTIPLY

2 PARENT FUNCTIONS

	Graph	Equation	Table of Values	Domain & Range
a)	Linear: 	$f(x) = x$	x: 0, 1, 2, 3, 4 y: 0, 1, 2, 3, 4	D: $\{x \in R\}$ R: $\{y \in R\}$
b)	Quadratic: 	$f(x) = x^2$	x: 0, 2, 3, -2, -3 y: 0, 4, 9, 4, 9	D: $\{x \in R\}$ R: $\{y \in R / y \geq 0\}$
c)	Cubic: 	$f(x) = x^3$	x: 0, 1, 2, -1, -2 y: 0, 1, 8, -1, -8	D: $\{x \in R\}$ R: $\{y \in R\}$
d)	Quartic: 	$f(x) = x^4$	x: 0, 1, 2, -1, -2 y: 0, 1, 16, 1, 16	D: $\{x \in R\}$ R: $\{y \in R / y \geq 0\}$

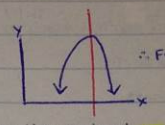
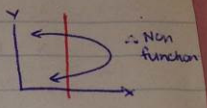
(CON'D)

UNIT 1

FUNCTIONS

i. **FUNCTIONS vs NON FUNCTIONS**

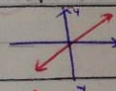
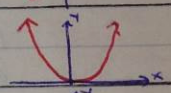
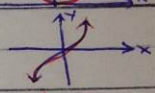
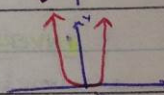
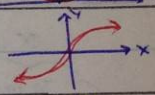
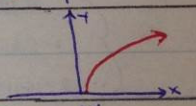
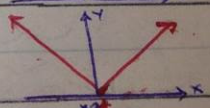
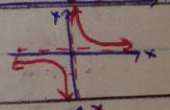
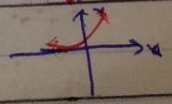
a. To be a function:

- Graph must pass the line test ex.  ∴ Function  ∴ Non function
- Function equations cannot have even power on the output y.
  ex. $y^{(4)} + x^{12} = 7$ ∴ Non Function
- Each x input has only one y output.

b. Function notation replaces output y with f(x)

ex. $y = 4x^2 + 12x - 7 \longrightarrow f(x) = 4x^2 + 12x - 7$

function's new name: $[f(x)]$ = whole thing is output; (x) = input

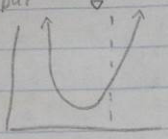
2.	Function	Equation	Table of Values	Domain + Range	Graph
a.	LINEAR	$f(x) = x$ $f(x) = mx + b$	X | Y 0 | 0 (0,0) 1 | 1 (1,1) 2 | 2 (2,2)	D = {x∈R} R = {y∈R}	
b	QUADRATIC	$f(x) = x^2$ $f(x) = a[k(x-d)]^2 + c$	X | Y 0 | 0 (0,0) 1 | 1 (1,1) 2 | 4 (2,4)	D = {x∈R} R = {y∈R | y≥0}	
c.	CUBIC	$f(x) = x^3$ $f(x) = a[k(x-d)]^3 + c$	X | Y 0 | 0 (0,0) 1 | 1 (1,1) 2 | 8 (2,8)	D = {x∈R} R = {y∈R}	
d.	QUARTIC	$f(x) = x^4$ $f(x) = a[k(x-d)]^4 + c$	X | Y 0 | 0 (0,0) 1 | 1 (1,1) 2 | 16 (2,16)	D = {x∈R} R = {y∈R | y≥0}	
e.	CUBE ROOT	$f(x) = \sqrt[3]{x}$ $f(x) = a\sqrt[3]{k(x-d)} + c$	X | Y 0 | 0 (0,0) 1 | 1 (1,1) 8 | 2 (8,2)	D = {x∈R} R = {y∈R}	
f.	SQUARE ROOT	$f(x) = \sqrt{x}$ $f(x) = a\sqrt{k(x-d)} + c$	X | Y 0 | 0 (0,0) 4 | 2 (4,2) 9 | 3 (9,3)	D = {x∈R | x≥0} R = {y∈R | y≥0}	
g	ABSOLUTE VALUE	$f(x) = \lvert x \rvert$ $f(x) = a\lvert k(x-d) \rvert + c$	X | Y 0 | 0 (0,0) 1 | 1 (1,1) 2 | 2 (2,2)	D = {x∈R} R = {y∈R | y≥0}	
h.	RATIONAL	$f(x) = \frac{1}{x}$ $f(x) = \frac{a}{k(x-d)} + c$	X | Y 1 | 1 (1,1) ½ | 2 (½,2) ¼ | 4 (¼,4)	D = {x∈R | x≠0} R = {y∈R | y≠0}	
i.	EXPONENTIAL GROWTH & DECAY	$f(x) = 2^x$ $f(x) = ab^{k(x-d)} + c$	X | Y 0 | 1 (0,1) 1 | 2 (1,2) 2 | 4 (2,4)	D = {x∈R} R = {y∈R | y>0}	

Functions vs. Non functions

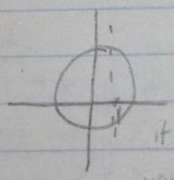
a) The graph must past a vertical line test

↳ it cannot hit a vertical line twice at any point of the graph b/c of the definition of a function

Function: Every input has only one output



- this is a fuction - only one y per x and passes the vertical line test



- a circle is not a function b/c it does not pass the vertical line test and has >1 outputs for every x

- Remember equations cannot have even powers on y because x will then always be either ±

ex. $y^3 + x^2 = 5$

This is a function b/c y has an even power → it doesn't matter if x has an even power

$y^2 = 4x + 2$

This is not a function because you can have a positive or negative, x, in each one

↳ $\sqrt{y^2} = \sqrt{4x+2}$

$y = \pm\sqrt{4x+2}$

b) in function notation, just look if every x-coordinate is only paired up with one y-coordinate

↳ {(1,3), (2,4) (1,-1), (3,5)}

1 has two different outputs so it isn't a function and cannot be represented as f(x)

UNIT ONE: # FUNCTIONS

6. ABSOLUTE VALUES

The ABSOLUTE VALUE, $|x|$, of a number is the positive number of any number.

ex. $|-6| = 6$

$|19| = 19$

Great!

This can also be used in equations ex. $\sqrt{|x-17|}$

Parent Function → $f(x) = |x|$

Piecewise Function → $f(x) = \begin{cases} x, \text{ if } x \geq 0 \\ -x, \text{ if } x < 0 \end{cases}$

GREAT JOB

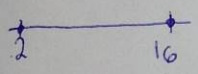
Two Dimensional

$y = \sqrt{|x+11|}$ ← this is a two dimensional representation of absolute value because it has two variables x and y, this graph will have two axis.

One Dimensional

$7 = |x-9|$ ← this is a one dimensional representation of absolute value because it only has one variable, x, this graph will only have one axis.

$x = 16$ or $x = 2$



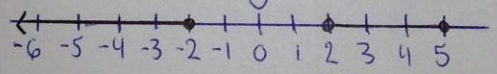
Great Work

Set Notation → { . . . }

Interval Notation → (, [

* smallest number first
(around greater than, [around less than

ex. write the following as both set notation and interval notation



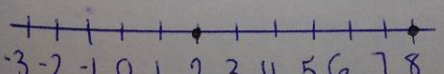
Set Notation: $\{x \in \mathbb{R} \mid x \leq -2, 2 < x \leq 5\}$

Interval Notation: $x \in (-\infty, -2], (2, 5]$

Only symmetrical solutions can be represented by an absolute value.

Absolute Value: $|x-6| = 3$

ex.



Very Good

Sept 14/2012.

Functions

1. Functions vs. Non Functions

a. Graphs and Equations

↳ Graphs - must pass a vertical line test for it to be a function (a function)

↳ Equations - as a function it cannot have even powers in the y. ($y^6 + x^3 = 2$ ← not a function)

↳ Functions - there is only one input (x-coordinate) for every output (y-coordinate)

b. Function Notation

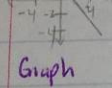
↳ Notation, such as $f(x)$, is used to represent the value of y, for the given value of x.

↳ Domain - the set of x-values

↳ Range - the set of y-values

2. Parent Functions

a. Linear



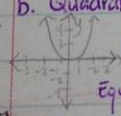
Domain: $\{x \in \mathbb{R}\}$ Range: $\{y \in \mathbb{R}\}$

Equation: $y = mx + b$ Standard: $Ax + By + C = 0$

Graph Table Values:

x	y
0	2
-3	0
3	4

b. Quadratic



Domain: $\{x \in \mathbb{R}\}$ Range: $\{y \in \mathbb{R} / y \leq 0\}$

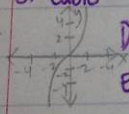
Equation (factored): $y = a(x-r)(x-t)$

Graph vertex: $y = a(x-h)^2 + k$ standard: $y = ax^2 + bx + c$

Table Values:

x	y
0	0

c. Cubic



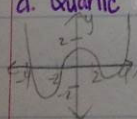
Domain: $\{x \in \mathbb{R}\}$ Range: $\{y \in \mathbb{R}\}$

Equation: $y = a[k(x-d)]^3 + c$

Graph Table Values:

x	y
1	0
-1	-2

d. Quartic



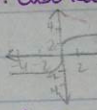
Domain: $\{x \in \mathbb{R}\}$ Range: $\{y \in \mathbb{R} / -2 \leq y \leq 2\}$

Equation: $y = ax^4 + bx^3 + cx^2 + dx + e$

Graph Table Values:

x	y
0	1
1	$\frac{1}{2}$
3	3

e. Cube Root



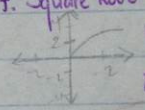
Domain: $\{x \in \mathbb{R}\}$ Range: $\{y \in \mathbb{R}\}$

Equation: $y = a\sqrt[3]{k(x-d)} + c$ Standard: $y = ax^3 + bx^2 + cx + d$

Graph Table Values:

x	y
0	1
-2	-2

f. Square Root



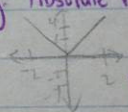
Domain: $\{x \in \mathbb{R}\}$ Range: $\{y \in \mathbb{R} / y \geq 0\}$

Equation: $y = a\sqrt{k(x-d)} + c$

Graph Table Values:

x	y
0	1
3	2

g. Absolute Value



Domain: $\{x \in \mathbb{R}\}$ Range: $\{y \in \mathbb{R} / y \geq 0\}$

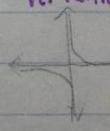
Equation: $y = |x|$

Graph Table Values:

x	y
0	0
1	1
2	2

x	y
0	0
-1	1
-2	2

h. Rational



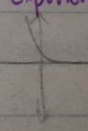
Domain: $\{x \in \mathbb{R}\}$

Range: $\{y \in \mathbb{R} / y \neq 0\}$

Graph Equation: $y = \frac{1}{k(x-d)} + c$

General: $y = \frac{a}{k(x-d)} + c$

i. Exponential Growth and Dec



Domain: $\{x \in \mathbb{R}\}$

Range: $\{y \in \mathbb{R} / y <$

Graph Equation: $y = ab^x +$

FUNCTIONS – journal
1. FUNCTIONS vs NON FUNCTIONS
   a. Graphs & equations
   b. Function notation
2. PARENT FUNCTIONS: graphs, equations

6.12

Functions - unit one

2. Parent Functions: graphs, equations, table of values, domain and range

a. Linear - $f(x) = x$ or $y = mx + b$
- Domain $\{x \in \mathbb{R}\}$ Range $\{y \in \mathbb{R}\}$

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

b. Quadratic - $f(x) = x^2$
- Domain $\{x \in \mathbb{R}\}$ Range $\{y \in \mathbb{R} | y \geq 0\}$

x	y
-4	16
-2	4
0	0
2	4
4	16

c. Cubic - $f(x) = x^3$
- Domain $\{x \in \mathbb{R}\}$ Range $\{y \in \mathbb{R}\}$

x	y
-2	-8
-1	-1
0	0
1	1
2	8

d. Quartic - $f(x) = x^4$
- Domain $\{x \in \mathbb{R}\}$ Range $\{y \in \mathbb{R}\}$

x	y
-2	16
-1	1
0	0
1	1
2	16

e. Cube Root - $f(x) = \sqrt[3]{x}$
- Domain $\{x \in \mathbb{R}\}$ Range $\{y \in \mathbb{R}\}$

x	y
-8	-2
0	0
8	2

f. Square Root - $f(x) = \sqrt{x}$
- Domain $\{x \in \mathbb{R} | x \geq 0\}$
- Range $\{y \in \mathbb{R} | y \geq 0\}$

$f(x) = af\sqrt{k(x-d)} + c$

x	y
0	0
1	1
4	2

g. Absolute Value - $f(x) = |x|$
- Domain $\{x \in \mathbb{R}\}$
- Range $\{y \in \mathbb{R} | y \geq 0\}$

$f(x) = af|k(x-d)| + c$

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

h. Rational - $f(x) = \frac{1}{x}$
- Domain $\{x \in \mathbb{R} | x \neq 0\}$
- Range $\{y \in \mathbb{R} | y \neq 0\}$

$f(x) = \frac{a}{k(x-d)} + c$

x	y
-2	-0.5
-1	-1
0	--
1	1
2	0.5

[graph]

i. Exponential Growth / Decay - $f(x) = ab^x + c$
- Domain $\{x \in \mathbb{R}\}$
- Range $\{y \in \mathbb{R} | y \geq 0\}$

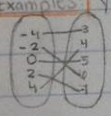
x	y
0	0
1	1
2	4
4	16

[graph]

1. Functions vs Non-Functions:

a. Graphs & equations - to be a function, a graph must pass the vertical line test; for every ONE input x there is an output y; equations cannot have even powers on the variable y.

Examples: $y^2 + x^3 = 1$, $y = \pm\sqrt{x^3 + 1}$ ~ since ± is in front, there are two answers. NOT a function



FUNCTION - one y output for every x input

Q: you dial a phone number (input) and a stranger answers (output)
↳ FUNCTION: one phone number can only be for one person.

$x^2 + y^2 = 16^2$
NOT A FUNCTION because it is a circle - fails vertical line test.

$y = 6x^2 + 5$
FUNCTION because this is a parabola which opens upwards.

b. Function Notation - replaces the output 'y' with function name & the input used in the function.

Examples: $f(x)$ — name of function, input

Q. Write the perimeter of a circle as a function of its radius.
$C = 2\pi r$
$r(x) = 2\pi C$

Q. If $h(x) = \frac{3x^2}{x-5}$, find $h(6)$ and $h(-1)$
① $h(6) = \frac{3(6)^2}{6-5} = \frac{108}{1}$
② $h(-1) = \frac{3(-1)^2}{-1-5} = \frac{-3}{6}$ or $-\frac{1}{2}$

c. Transformations: $y = af[k(x-d)] + c$

- a represents a vertical stretch ($|a| > 1$) or compression ($|a| < 1$); reflection in the x-axis if $a < 0$.
- k represents a horizontal stretch ($|k| < 1$) or compression ($|k| > 1$); reflection in the y-axis if $k < 0$.
- d represents a horizontal shift
- c represents a vertical shift.

TO APPLY TRANSFORMATIONS
↳ Factor out the k to see d.
↳ apply stretches/compressions to a T.O.V
↳ ~~Stretch~~ FINAL Table.

x	y	→	x/k	y·a	→	x+d	y+c
any x values							

parent function → FINAL

Ex. $y = \frac{3}{2x-6} - 8$
↳ parent = $\frac{1}{x}$
↳ $y = \frac{3}{2(x-3)} - 8$

- vertical stretch by factor 3
- horizontal compression by factor $\frac{1}{2}$.
- Shift 3 units right
- Shift 8 units down
- VA → 6 ; HA → -8

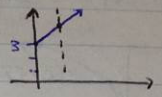
1. Functions vs. Non Functions

a) Graphs + Equations

function - has only 1 y-value for each x-value

- passes vertical line test → draw vertical line through graph, if only intersects once, it passes!
- uses function notation

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

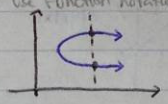


✓passes vertical line test

non-function - x-values have 2 or more y-values ∴ doesn't pass vertical line test

- does NOT use function notation
- equations have y^2, y^3 ... etc.

ex) $y = \pm\sqrt{x}$



✗passes vertical line test

b) Function Notation

↳ instead of 'y =' functions use f(x) =

↳ x = independent variable / output

↳ y = dependent variable / input

ex) write $y = \pm\sqrt{x}$ using function notation

$f(x) = \sqrt{x}$ — these are both now function because they are separate pieces of one graph that was NOT a function

$f(x) = -\sqrt{x}$

ex) $f(x) = 2(x-1)^2 + 3$ let $x = 3$

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

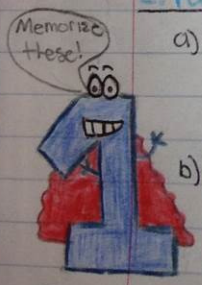
$= 2(2)^2 + 3$

$= 8 + 3$

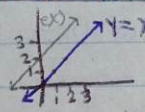
$f(3) = 11$

- when I input a value of 3, I get an output of 11 for this function

2. Parent Functions



a) linear



general formula:

$y = mx + b$

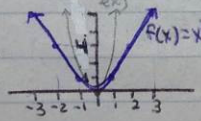
slope ↳ y-intercept

x	1	2	3	4
y	1	2	3	4

D: {x ∈ R}

R: {y ∈ R}

b) quadratic



$f(x) = x^2$ has 3 different formulas: $f(x) = a(x-r)(x-s)$ (zeros)

$f(x) = a[k(x-d)]^2 + c$ (x,y) of vertex

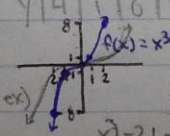
$f(x) = ax^2 + bx + c$ ← y-int.

D: {x ∈ R}

R: {y ∈ R | y ≥ 0}

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

c) cubic



general formula:

$f(x) = ax^3 + bx^2 + cx + d$ OR

$f(x) = a[k(x-d)]^3 + c$

D: {x ∈ R}

R: {y ∈ R}

x	-2	-1	0	1	2
y	-8	-1	0	1	8