Week 3 Wed 1

Ann: Today last day to take test 1!

Hope: T1 graded by Monday

Preview: 1) a) eqn of line through $(-1,2)$ and $(4,2)$ (rec)

$y-2=0(x+1) \to y=2$

b) eqn of line parallel to (c) through $(-4,8)$ $y=8$

c) eqn of line perpendicular to (a) through $(2,7)$

$x=2$

2) advanced: which defines y as function of x? (y) (x)

a) $(y-5)^2-25=x$

Set $x=0$, then $(y-5)^2=25$

$y-5=\pm\sqrt{25}$

$y=5\pm 5$, $\begin{matrix}10\\0\end{matrix}$ Bad.

b) $|x|-y=3$

$|x|=3+y$ ✓ input any x, only one output y.

$|x|-3=y$

c) $|x|=|y|$

Note: $|1|=|1|$

and $|1|=|-1|$

So $(1,1)$ and $(1,-1)$ on curve, fails vert. line test.

d) $\frac{y^2}{3}=x$

Note $\frac{(-\sqrt{3})^2}{3}=1$

and $\frac{(\sqrt{3})^2}{3}=1$

So $(1,-\sqrt{3})$ and $(1,\sqrt{3})$ on curve

$\therefore$ not func.

3) $f(x)=\frac{x+7}{3x^2+2}$ find $f(\sqrt{y}+2)$

$$f(\sqrt{y}+2)=\frac{\sqrt{y}+2+7}{3(\sqrt{y}+2)^2+2}=\frac{\sqrt{y}+9}{3(y+4\sqrt{y}+4)+2}$$

$$=\frac{\sqrt{y}+9}{3y+12\sqrt{y}+12+2}=\frac{\sqrt{y}+9}{3y+12\sqrt{y}+14}$$

Later more simplifying can be done.

Content: M3.d1, M3.d2 Start w//

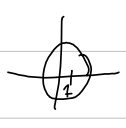
Defn: - A relation R is a set of ordered pairs: $\{(x,y) \mid x\in X, y\in Y\}$

- A function is a relation such that for each $x\in X$, there is one and only one y such that $(x,y)\in R$.

non-ex) $\{(1,2),(1,4),(5,4)\}$

$1\to 2$, $1\to 4$ Bad

non-ex) let R be points on



Note $(1,\text{some pos})$ and $(1,\text{some neg})$ are in R, so not a func.

Notation:

$f: A \to B$ (f: name, A: domain, B: codomain)

$a \mapsto f(a)$ (rule)

ex) $f:\mathbb{Z}\to\mathbb{Q}$ } Common on whiteboard

$z \mapsto z/2$

also notation: ex) let $g:\mathbb{R}\to\mathbb{R}$ where $g(r)=r^2+2$ — Common in writing

def: The image (or range) of $f:A\to B$ is $\{f(a): a\in A\}$, i.e. the values f may achieve in B.

Goto M3.d1

W3 F1

Ann:- T 1 Avg 86 ish
- P. credit added
- U. hours
  - 9:30 – 11:30
    - talk to me to see where wrong

- wiki: today, change laptops
  - on BB

CP) review: 1) ⊥ line to $3x+7y=8$ through $(1,2)$

2) Is equation a function of x?
   a) $\sqrt[5]{x}+y=7y$
   b) $3x+7y^2=4x-x$

3) $f(x)=3x^2+2$; if $g(x+1)=f(x)$, what is $g(y)$?
   Note $g(y)=g((y-1)+1)=f(y-1)$

$$f(y-1)=3(y-1)^2+2$$
$$=3(y^2-2y+1)+2$$
$$=3y^2-6y+5$$
$$=g(y)$$

4) Henry preview, module 4

Domain of $f(x)=\sqrt{\frac{6}{x-7}}$

$\text{Dom}(\sqrt{\ })=[0,\infty)$

$\text{Dom}(\frac{1}{x})=(-\infty,0)\cup(0,\infty)$

$\text{Dom}(\frac{6}{x-7})$: $x-7\neq 0$, $(-\infty,7)\cup(7,\infty)$

$x\neq 7$

$\frac{6}{x-7}\geq 0$

$6\geq 0(x-7)$; $x-7>0$

true for $x>7$

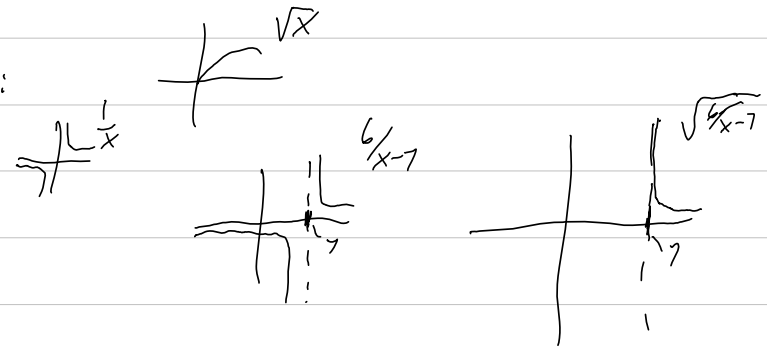
$6\leq 0\cdot(x-7)$; $x-7<0$

multiply

False for $x<7$

So, Domain $(f)=(7,\infty)$

Graphs:



Content: - M3.d2. fu notation
- wiki last 30+ min

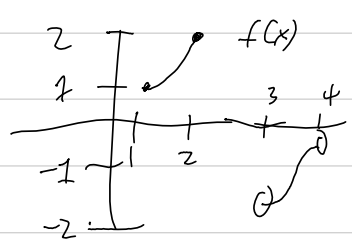
Domain + Range — Week 4 Monday 1

Anh T2: 20th + 23rd
kC2: Thursday

(P)review: 1) In what variables is the following expression a function of? Restrictions on Domain?

$$x^2 + y - \sqrt{z} = \frac{4}{w}$$

2) Domain of $f(x) = \frac{\sqrt{10-x}}{(7-x)(x+2)}$?

3) 

Domain + Range of f(x)?

4) Graph and give domain + Range for $f(x) = -(x-2)+3$

Contents: BB 4.1a, 4.1b+c — Before: Interval notation

Defn: I.N. (note $a<b$ always)

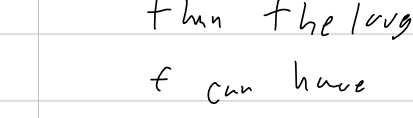
Aleks Num. — Number line

$(a,b) = \{r \in \mathbb{R} : a < r < b\}$

$(a,b] = \{r \in \mathbb{R} : a < r \leq b\}$

$[a,b) = \{r \in \mathbb{R} : a \leq r < b\}$

$[a,b] = \{r \in \mathbb{R} : a \leq r \leq b\}$



$\subseteq$ subset; $\mathcal{U}$ — universe

Defn: Let A, B be two sets.

intersection: $A \cap B = \{a \in A : a \in B\} = \{b \in B : b \in A\}$ — in both

union: $A \cup B = \{u \in \mathcal{U} : u \in A \text{ or } u \in B\}$ — Shove together.

setminus: $A \setminus B = \{a \in A : a \notin B\}$ — A take away B.

ex) $\{1,2\} \cap \{2,3\} = \{2\}$
$\{1,2\} \cup \{2,3\} = \{1,2,3\}$
$\{1,2\} \setminus \{2,3\} = \{1\}$

I'll use for expedience / clarity, not used in Aleks/tests

Now 4.1a

Domain and Range:

Recall: $f: A \to B$ — A: domain (inputs); B: codomain (outputs)

Def: $f(A) = \text{Image}(f) \subseteq \text{Range}(f)$
$= \{b \in B : \exists a \in A \text{ s.t. } f(a) = b\}$
$= \{f(a) : a \in A\}$

Def: A function f is continuous at x if for every $\varepsilon > 0$, there exists $\delta > 0$ such that for all x' with $|x - x'| < \delta$, then $|f(x) - f(x')| < \varepsilon$.

graphically: it doesn't jump at x.

A function is continuous if it is cont. on for all x in its domain.

both classes end Monday/start Friday, Wednesday sub.

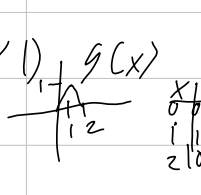
Def: Let $A \subseteq \mathcal{U}$ and $f: A \to B$. The excluded values of f is $\mathcal{U} \setminus A$.

ex: let f have rule $f(x) = \frac{1}{x}$.
then the largest domain $A \subseteq \mathbb{R}$ that f can have is $A = (-\infty, 0) \cup (0, \infty)$.
So the excluded values of f is $\{0\}$.

Now 4.1b and 4.1c — hope, where ever sub gets to.

Ann: Do KC, test 2: 20th, 23rd. / will @ 30 min till

(Preview 1) g(x) draw for $2g(x-1)+2$



x	g
0	0
1	1
2	0

$(x+1, 2g+2)$ →

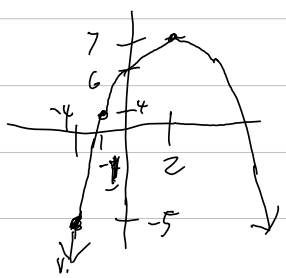
x	f
1	2
2	4
3	2

2) graph $f(x) = -2|x-4|+5$

3) find domain of

$$f(x) = \frac{\sqrt{8}}{\sqrt{-6+x}} - \frac{9}{\sqrt{49-x^2}}$$

4) AROC from $x=-4$ to -1 of



$$AROC(f, x_1, x_2) = \frac{f(x_1)-f(x_2)}{x_1-x_2}$$

5) Domain of $f(x) = \frac{\sqrt{x+2}}{3x+5}$

Content.

Domain of $\frac{f}{g} = Dom(f) \cap Dom(g) \setminus g^{-1}(0)$

$f \pm g = Dom(f) \cap Dom(g)$

W5M1

Ann: - KC 2 due soonish (19th)
- Test 2 20th + 23rd

Review: go over wiki 3+4

Content: - 5.1a - BB
↘ start here Monday

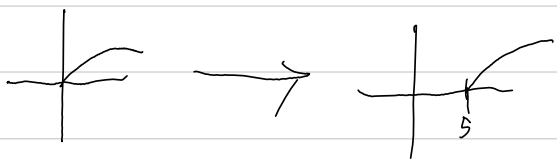
Prop: if f turns forms to
$$k(x) = h(f(g(x))),$$
then each $(x, f(x)) \in \text{Graph}(f)$
becomes $(g^{-1}(x), h(f(x))) \in \text{Graph}(k)$.

ex) $f(x) = \sqrt{x}$; Find $k(x) = f(x-5) = \sqrt{x-5}$
$h = id$, $g(x) = x-5$, $g^{-1}(x) = x+5$

x	$\sqrt{x}$
0	0
1	1
4	2
9	3

$(x,y) \mapsto (x+5, y)$

x	$\sqrt{x-5}$
5	0
6	1
9	2
14	3



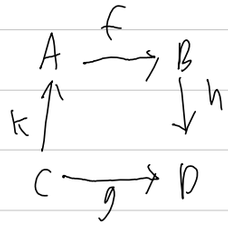
W5D1

~~Move Aleks 5.2 to today.~~

- No points, just practise w/ tool.

1) -5.16 BB Note if $g(x) = h(f(k(x)))$ then $g(k^{-1}(x)) = h(f(x))$

question 2 and for both



4) -5.2 BB game 6 groups.

first group to draw correct graph wins

2) Info :- Last 30 min wiki's.
- Test 2
  - modules 3-5
  - Review on Aleks
  - Avg est. time: 30 minutes
  - time alloted: 75 min.
  - 15-20 Standard Aleks Q's
  - L2-4 wiki-like multi-parts at end

3) Review: 1) on Aleks do transform graph of func w/ more than 1 transformation.

2) Graph $y = -2\sqrt{-3x+4} + 1$

3) $f(x) = -2\sqrt[3]{x-4}$; find $f(-60)$