

Week 3 Wed 1

Ann Today (today) to take test 1!

Hope: T1 graded by Monday

(Preview: ^{rev} 1) ^{a)} eqn of line through $(-1, 2)$ and $(4, 2)$
 $y - 2 = 0(x + 1) \rightarrow y = 2$

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 a ^x function of x ?

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

set $x = 0$, then $(y - 5)^2 = 25$
 $y - 5 = \pm \sqrt{25}$
 $y = 5 \pm 5$
 $y = 10$ or $y = 0$
 Bad.

b) $|x| - y = 3$

$|x| = 3 + y$
 $|x| - 3 = y$ ^{input any}
^{only one value for y.}

c) $|x| = |y|$

Note: $|1| = |1|$

and $|1| = |-1|$

so $(1, 1)$ and $(1, -1)$

on curve, fails

vert. line test.

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

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

so $(1, -\sqrt{3})$ and

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

not a func.

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

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

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

Later more simplifying can be done.

(Content: M3.d1

Start with

M3.d2

Defn: - A relation

R is a set of ordered

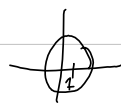
pairs: $\{(x, y) \mid x \in X, y \in Y\}$

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

$1 \rightarrow 2$
 $1 \rightarrow 4$ 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:

$f: A \rightarrow B$
^{name} ^{domain} ^{codomain}
 $a \mapsto f(a)$
^{rule}

ex) $f: \mathbb{Z} \rightarrow \mathbb{Q}$ } common whiteboard
 $z \mapsto z/2$

also ex) let $g: \mathbb{R} \rightarrow \mathbb{R}$ $g(r) = r^2 + 2$ - common writing

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

Goto M3.d1

W3 F1

Ann: - T 1 Aug 86 ish

↳ P. credit added

↳ U. hours

9:30 - 11:30

↳ talk to me to see when wrong

- wiki: today, change laptops

↳ on BB

(P)review: 1) \perp line to $3x+7y=8$ through $(1,2)$

2) Is $y = \sqrt{x}$ an even function of x ?

a) $\sqrt{x} + y = 7y$

b) $3x + 7y^2 = 4x - x$

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

Note $g(y) = g(\overbrace{y-1}^x + 1) = f(y-1)$

$$\begin{aligned} f(y-1) &= 3(y-1)^2 + 2 \\ &= 3(y^2 - 2y + 1) + 2 \\ &= 3y^2 - 6y + 5 \\ &= g(y) \end{aligned}$$

4) Henry preview, module 4

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

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

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

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

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

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

true for $x > 7$

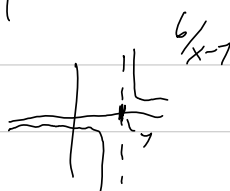
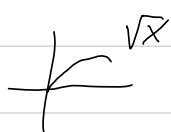
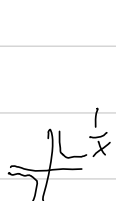
$6 \leq 0 - (x-7); x-7 < 0$

multiply

Fulge for $x < 7$

So, $\text{Domain}(f) = (7, \infty)$

Graphs:



Content: - M3.d2. fu notation

- wiki last 30 + min

Domain + Range

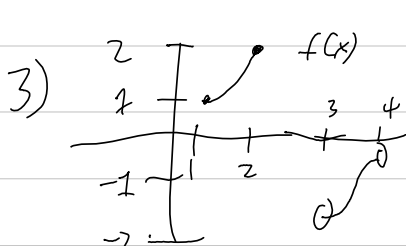
Week 4 Monday 1

Ans T2: 20th + 23rd
T3: Thursday

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

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

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



Domain + Range of f ?

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)

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

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

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

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

Defn: Let A, B be two sets.

$A \subseteq B$ - subset

$B \subseteq U$ - universe

Intersection: $A \cap B = \{a \in A : a \in B\} = \{b \in B : b \in A\}$ - in both

Union: $A \cup B = \{u \in U : u \in A \text{ or } u \in B\}$ - share together

Setminus: $A \setminus B = \{a \in A : a \notin B\}$ - A take away B

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

$\{1, 2, 3\} \cup \{2, 3\} = \{1, 2, 3\}$

$\{1, 2, 3\} \setminus \{2, 3\} = \{1\}$

I'll use for
explanation/
clarity, not used
in Alets/ tests

Now 4.1a

Domain and Range:

Recall: $f: A \rightarrow B$

domain codomain
inputs outputs

Def: $f(A) = \text{Image}(f) = \text{Range}(f)$

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

$= \{f(a) : a \in A\}$

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

graphically: it doesn't jump at x .

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

Def: Let $A \subseteq U$ and $f: A \rightarrow B$. The
excluded values of f is $U \setminus A$.

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