Key
Fall '18

ICM ~ Unit 4 ~ Day 4

Range & Practice

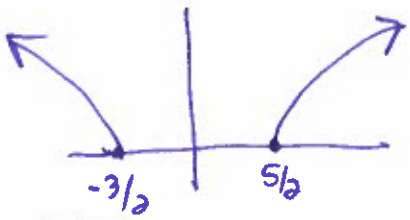
Warm Up ~ Day 4

1. Find the domain, range, x-intercepts, and y-intercepts, and end behavior using limit notation.

$$f(x) = \sqrt{4x^2 - 4x - 15}$$

2. Find the domain, x & y intercepts, and label any discontinuities:

$$h(x) = \frac{\sqrt{x+15}}{x-3}$$



$\lim_{x\to-\infty} f(x) = \infty$

$\lim_{x\to\infty} f(x) = \infty$

Warm Up ~ Day 4

1. Find the domain, range, x-intercepts, and y-intercepts, and end behavior using limit notation.

$f(x) = \sqrt{4x^2 - 4x - 15}$

R: $[0,\infty)$

*Be careful looking at graph!!

test -10: $\sqrt{400+40-15}$ ✓ | test x=0: $\sqrt{0-0-15}$ | test x=10: $\sqrt{400-40-15}$ ✓

-3/2, 5/2

2. Find the domain, x & y intercepts, and label any discontinuities:

$h(x) = \frac{\sqrt{x+15}}{x-3}$

VA x=3 nonremovable, infinite disc.

test x=0 ✓

-15

Warm Up ~ Day 4 ANSWERS

1. Find the domain, range, x-intercepts, and y-intercepts and end behavior using limit notation.

$f(x) = \sqrt{4x^2 - 4x - 15} = \sqrt{(2x+3)(2x-5)}$

$x-\text{int}: (-3/2, 0) \& (5/2, 0)$ $\quad y-\text{int}: \text{none}$

$\text{Domain}: (-\infty, -3/2] \cup [5/2, \infty)$ $\quad \text{Range}: [0,\infty)$

$\lim_{x\to\infty} f(x) = \infty$ $\quad \lim_{x\to-\infty} f(x) = \infty$

2. Find the domain, x & y intercepts, and label any discontinuities:

$h(x) = \frac{\sqrt{x+15}}{x-3}$

$\text{Domain}: [-15,3) \cup (3,\infty)$

$x-\text{int}: (-15, 0)$

$y-\text{int}: (0, -\frac{\sqrt{15}}{3})$

Nonremovable Discontinuity (Vertical Asymptote at x = 3)

Homework Answers

Packet p. 4-5 (Asymptote Lab)
& Finish PSAT Handouts

Tonight's Homework
Quiz #1 Review Handout

Notes Day 4:
Range and Practice

A Graphical Approach

Notes: Finding the Range of a Function

- Use numeric, algebraic and graphical approaches simultaneously.
- Keep in mind we are finding ALL y-coordinates of points on the graph.
- Write the range of the following functions in interval notation.

$f(x) = \sqrt{3x-12}$

$g(x) = \dfrac{x^2-9}{x^2-x-12}$

$h(x) = \dfrac{\sqrt{x+1}}{x-4}$

Horizontal Asymptotes? ???

Notes: Finding the Range of a Function

- Use numeric, algebraic and graphical approaches simultaneously.
- Keep in mind we are finding ALL y-coordinates of points on the graph.
- Write the range of the following functions in interval notation.

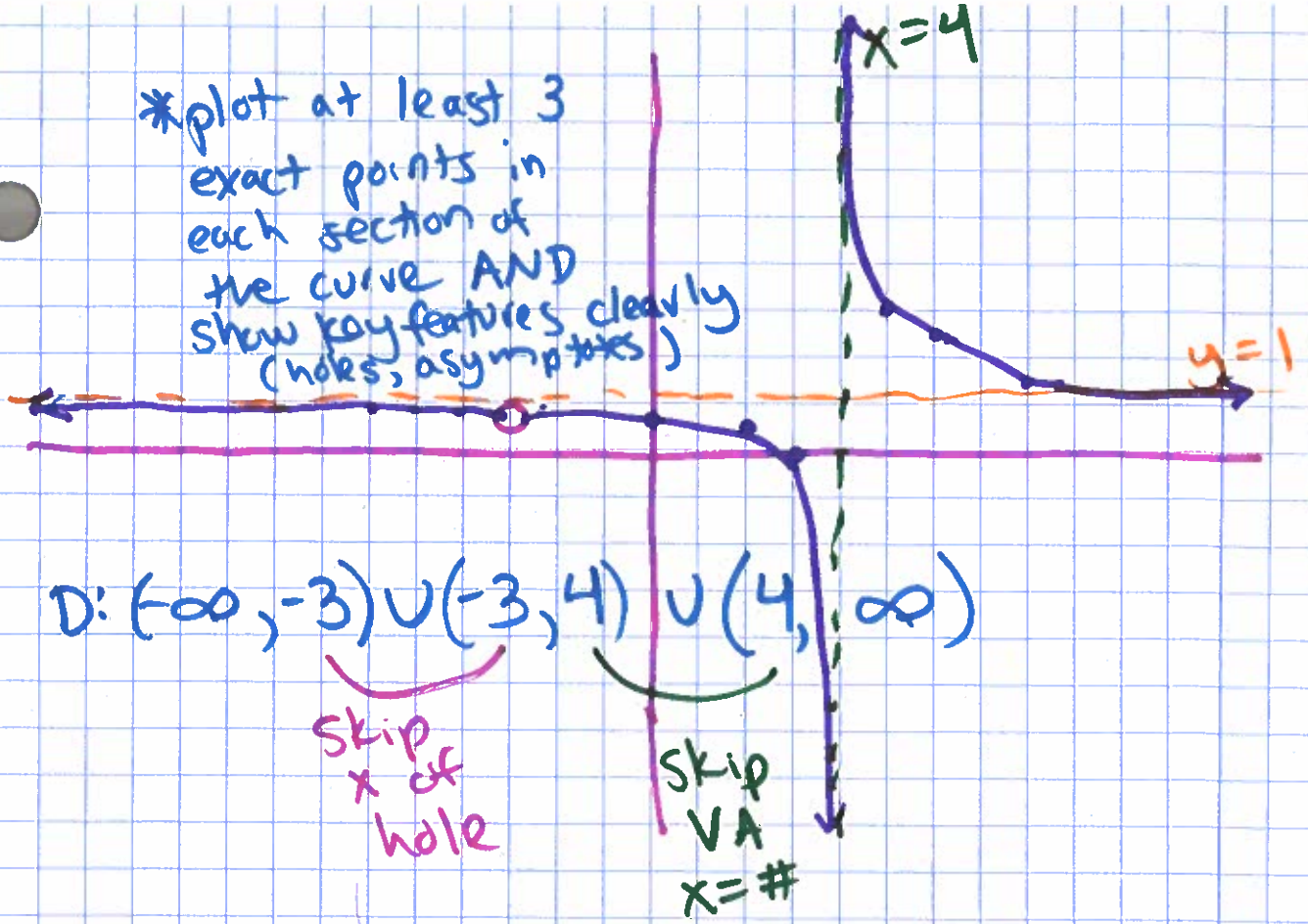
$f(x) = \sqrt{3x-12}$ *Range* : $[0,\infty)$

$g(x) = \dfrac{x^2-9}{x^2-x-12}$ *Range* : $(-\infty, 6/7) \cup (6/7, 1) \cup (1,\infty)$

$h(x) = \dfrac{\sqrt{x+1}}{x-4}$ *Range* : $(-\infty,\infty)$

Horizontal Asymptotes? ???

*plot at least 3 exact points in each section of the curve AND show key features clearly (holes, asymptotes)



D: $(-\infty, -3) \cup (-3, 4) \cup (4, \infty)$

skip x of hole

skip VA x=#

R: $(-\infty, 6/7) \cup (6/7, 1) \cup (1, \infty)$

skip y of hole

skip HA y=#

Day 4 started Here Fall '18

Remember: least to greatest so go bottom to top

Finding the Range of a Function

- Use numeric, algebraic and graphical approaches simultaneously.
- Keep in mind we are finding ALL y-coordinates of points on the graph. * Radicals typically have a vertex * Rationals skip HA & y of hole
- Write the range of the following functions in interval notation.

You Try!

$f(x) = \sqrt{2x+7}$ R: $[0, \infty)$

$g(x) = \frac{8}{2x+12}$ R: $(-\infty, 0) \cup (0, \infty)$

$m(x) = \frac{\sqrt{x}}{x-9}$ R: $(-\infty, \infty)$

Horizontal Asymptotes? ???

Finding the Range of a Function

- Use numeric, algebraic and graphical approaches simultaneously.
- Keep in mind we are finding ALL y-coordinates of points on the graph.
- Write the range of the following functions in interval notation.

$f(x) = \sqrt{2x+7}$ $Range: [0, \infty)$

$g(x) = \frac{8}{2x+12}$ $Range: (-\infty, 0) \cup (0, \infty)$

$m(x) = \frac{\sqrt{x}}{x-9}$ $Range: (-\infty, \infty)$

Horizontal Asymptotes? ???

Summary

Domain: (x = #)

Consider the **vertical asymptotes** and the x-value of the **hole** (,)

Make sure values under the radical are positive (find x-int for √)

Range: (y = #)

Consider the **horizontal asymptotes** and the y-value of the **hole**

*for √

x-intercept:

Set **y = 0** and solve for **x**. (,)

y-intercept:

Set **x = 0** and solve for **y**. (,)

Practice!

Find the...
- -Domain
- -x & y intercepts
- -End Behavior using limits
- -Range

Remember, get hole & VA to help with domain

*Remember, get hole & HA to help with range

24.) $g(x) = \dfrac{x}{x-2}$

11.) $f(x) = \dfrac{1(x-1)}{(x+3)(x-1)}$

21.) $g(x) = \dfrac{3}{x} + 1$

23.) $f(x) = \dfrac{|x-1|}{x}$

* Do #11 together + #23 together

Hole at $x = 1$

$y = \frac{1}{x+3} = \frac{1}{1+3} \to \frac{1}{4}$ Hole at $(1, 1/4)$

x-int $0 = \frac{1}{x+3}$ $0 = 1 \to$ No x-int

y-int $y = \frac{1(0-1)}{(0+3)(0-1)} = \frac{1}{3}$ y-int $(0, 1/3)$

VA: $x = -3$ from extra denom.

End Beh: $\lim_{x\to\infty} f(x) = 0$; $\lim_{x\to-\infty} f(x) = 0$

HA: $y = 0$

D1 D2

R: $(-\infty, 0) \cup (0, 1/4) \cup (1/4, 0)$

D: $(-\infty, -3) \cup (-3, 1) \cup (1, \infty)$

Textbook: p.98

Skip HA — Skip y of hole — Skip VA — Skip x of Hole

Textbook: p.98

Find the...
- -Domain
- -x & y intercepts
- -End Behavior using limits
- -Range

24.) $g(x)=\frac{x}{x-2}$ DI → ratio $y=\frac{1}{1}$

VA: $x=2$

HA: $y=1$

Hole: none (no common factor to "slash")

End Beh $\lim_{x\to\infty} g(x)=1$; $\lim_{x\to-\infty} g(x)=1$

x-int: $0=\frac{x}{x-2}$, $0=x$, x-int $(0,0)$

y-int $(0,0)$: $y=\frac{0}{0-2}=0$

D: $(-\infty,2)\cup(2,\infty)$ (skip VA)

R: $(-\infty,1)\cup(1,\infty)$ (skip HA)

11.) $f(x)=\frac{1(x-1)}{(x+3)(x-1)}$

Hole at $(1,\frac{1}{4})$ ($\frac{1}{1+3}$)

VA: $x=-3$

HA: $y=0$ DI/D2

x-int

Textbook: p.98

Find the...
- -Domain
- -x & y intercepts
- -End Behavior using limits
- -Range

21.) $g(x)=\frac{3}{x}+1$

End Beh $\lim_{x\to\infty} g(x)=1$; $\lim_{x\to-\infty} g(x)=1$

VA: $x=0$

HA: $y=1$ (look in calc with Δtbl = 100)

Holes: none

x-int: $0=\frac{3}{x}+1$, $-1=\frac{3}{x}$, $-x=3$, $x=-3$

x-int $(-3,0)$

y-int: $y=\frac{3}{0}+1$ → y-int none

D: $(-\infty,0)\cup(0,\infty)$

R: $(-\infty,1)\cup(1,\infty)$

23.) $f(x)=\frac{|x-1|}{x}$

VA: $x=0$

Holes: none

D: $(-\infty,0)\cup(0,\infty)$ (skip VA)

End Beh $\lim_{x\to\infty} f(x)=1$; $\lim_{x\to-\infty} f(x)=-1$

R: $(-\infty,-1)\cup[0,\infty)$

x-int: $0=\frac{|x-1|}{x}$, $0=|x-1|$, $x=1$

x-int $(1,0)$

y-int: $y=\frac{|0-1|}{0}$

y-int: none

Textbook: p.98

Find the...
- -Domain
- -x & y intercepts
- -End Behavior using limits
- -Range

24.) $g(x) = \dfrac{x}{x-2}$

$\lim_{x\to\infty} g(x) = 1$

$\lim_{x\to-\infty} g(x) = 1$

Domain: $(-\infty, 2) \cup (2, \infty)$

Range: $(-\infty, 1) \cup (1, \infty)$

$x-$int : $(0, 0)$

$y-$int : $(0, 0)$

11.) $f(x) = \dfrac{x-1}{(x+3)(x-1)}$

$\lim_{x\to\infty} f(x) = 0$

$\lim_{x\to-\infty} f(x) = 0$

Domain: $(-\infty, -3) \cup (-3, 1) \cup (1, \infty)$

Range: $(-\infty, 0) \cup (0, \frac{1}{4}) \cup (\frac{1}{4}, \infty)$

$x-$int : *none*

$y-$int : $(0, \frac{1}{3})$

Hole : $(1, \frac{1}{4})$

Textbook: p.98

Find the...
- -Domain
- -x & y intercepts
- -End Behavior using limits
- -Range

21.) $g(x) = \dfrac{3}{x} + 1$

$\lim_{x\to\infty} g(x) = 1$

$\lim_{x\to-\infty} g(x) = 1$

Domain: $(-\infty, 0) \cup (0, \infty)$

Range: $(-\infty, 1) \cup (1, \infty)$

$x-$int : $(-3, 0)$

$y-$int : *none*

23.) $f(x) = \dfrac{|x-1|}{x}$

$\lim_{x\to\infty} f(x) = 1$

$\lim_{x\to-\infty} f(x) = -1$

Domain: $(-\infty, 0) \cup (0, \infty)$

Range: $(-\infty, -1) \cup [0\infty)$

$x-$int : $(1, 0)$

$y-$int : *none*

Fall `18

Asymptote Lab
Packet p. 4-5

HW
Packet p. ~~6~~ 4-5

& Finish PSAT Handouts