ICM ~Unit 3 ~ Day 1

Section 1.2—Domain, x & y intercepts

Warm Up ~ What do you remember???

For #1 and #2, for each question:

a. Factor, if possible

b. Solve

1. $25 - x^2 = 0$

2. $x^2 - 17 = 0$

Simplify Completely

3. $(9x^2y^3)^{\frac{1}{2}}$

4. $f(x-5)$ *given* $f(x) = 3x^2 - 2x$

5. Find the y-intercept, if any, of $f(x) = \dfrac{x-4}{x}$

Warm Up ~ ANSWERS

For #1 and #2, for each question:

a. Factor, if possible

b. Solve

1. $25 - x^2 = 0$

$factors: (5-x)(5+x)$

$solutions: x = 5, -5$

2. $x^2 - 17 = 0$

$factors: none$

$solutions: x = \pm\sqrt{17}$

Simplify Completely

3. $(9x^2y^3)^{\frac{1}{2}}$

$3xy^{\frac{3}{2}}$

Warm Up ~ ANSWERS

Simplify Completely

4. $f(x-5)$ *given* $f(x)=3x^2-2x$

$$f(x-5)=3x^2-32x+85$$

5. Find the y-intercept of $f(x)=\dfrac{x-4}{x}$

none – cannot divide by zero

Warm Up ~ ANSWERS

For #1 and #2, for each question:

a. Factor, if possible

b. Solve

1. $25 - x^2 = 0$

2. $x^2 - 17 = 0$

Simplify Completely

3. $(9x^2y^3)^{\frac{1}{2}}$

Warm Up ~ ANSWERS

Simplify Completely

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Discuss HW

- Factoring & Function Review

Notes Day 1

Section 1.2—Domain of functions,
and x & y intercepts

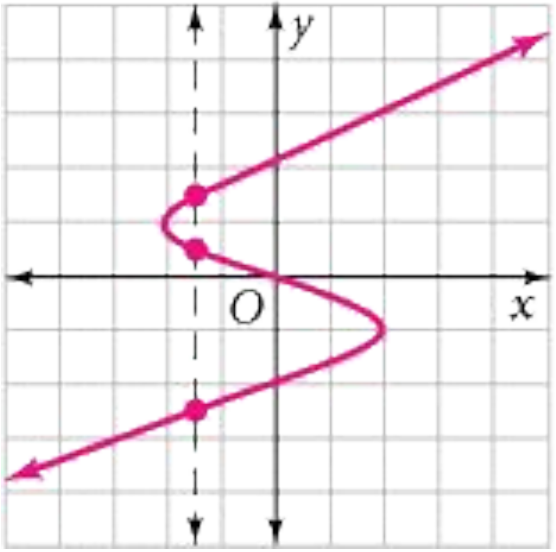
What is a Function?

- A rule that associates every value in a set of numbers (***domain***) with a SINGLE value in another set of numbers (***range***)***.***

- Notation: *f(x)* is the value of the function at a given value of "*x*"

Function vs Not Function

- ***Vertical line test***—used to graphically verify that the domain values are associated with only ONE range value

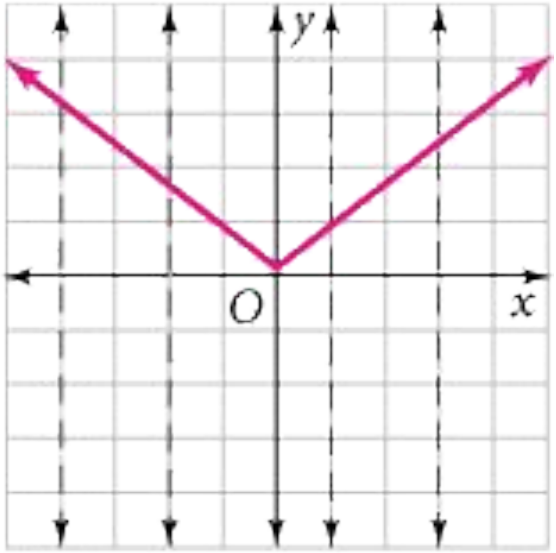


Vertical line passes through

← 3 points 1 point →

← Not a function

A function →



Definition of Domain:

- Set of real numbers that result in a "defined" or mathematically possible statement.
- Use interval notation!

  ( ) Not included [ ] included

- Examples:

  (0, 10] $(-\infty, \infty)$ $(-\infty, 0] \cup [1, \infty)$

- Never write ones like $(0, -\infty)$

  Smallest value must always be on the left!

Real Life Examples

- **Domain for ages of students at GHHS**
  D: [13, 21] ages
  R: [1, 500] number of students per grade

- **What is the domain for a cash payment of $6.47?**
  (what are all possible ways to pay this amount?)

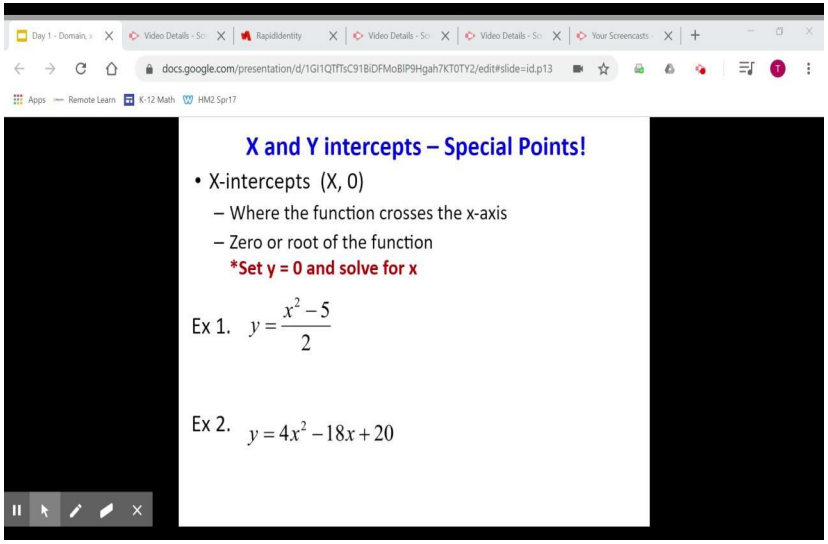
  D: pennies, nickels, dimes, quarters, $1, $5, dollar coin, $2
  R: amount of each coin, [0, 647]

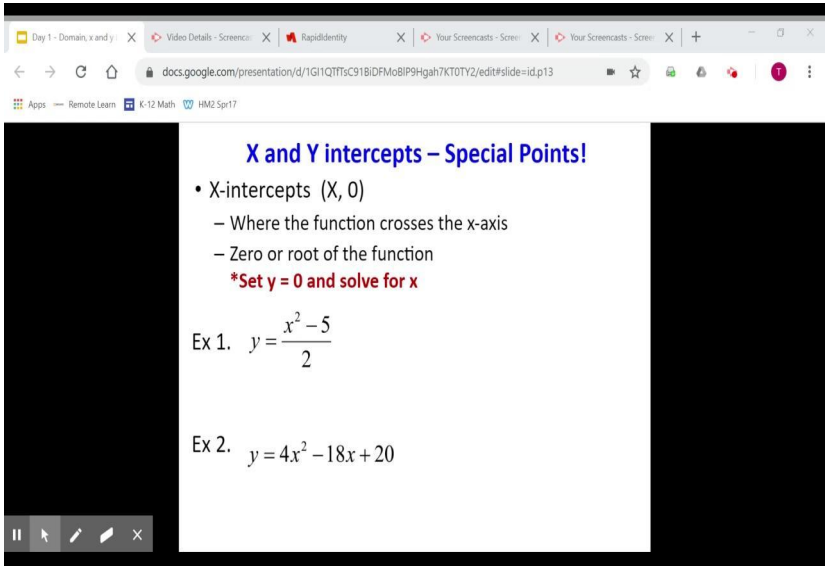
X and Y intercepts – Special Points!

- X-intercepts (X, 0)
  - Where the function crosses the x-axis
  - Zero or root of the function

***Set y = 0 and solve for x**

Ex 1. $y = \dfrac{x^2 - 5}{2}$ Ex 2. $y = 4x^2 - 18x + 20$





X and Y intercepts – Special Points ANSWERS!

- X-intercepts (X, 0)
  - Where the function crosses the x-axis
  - Zero or root of the function

***Set y = 0 and solve for x**

Ex 1. $y = \frac{x^2 - 5}{2}$ $\quad 0 = \frac{x^2 - 5}{2}, \quad x^2 = 5, \quad x = \pm\sqrt{5}$

$$(\sqrt{5}, 0) \text{ and } (-\sqrt{5}, 0)$$

Ex 2. $y = 4x^2 - 18x + 20$

$$(2, 0) \text{ and } (\frac{5}{2}, 0)$$

X and Y intercepts – Special Points!

- Y-intercepts (0, Y)
  - Where the function crosses the y-axis
  - Where x equals 0

***Set x = 0 and solve for y**

Ex 1. $y = \dfrac{x^2 - 5}{2}$ **Ex. 2** $y = 4x^2 - 18x + 20$

X and Y intercepts – Special Points ANSWERS!

- Y-intercepts (0, Y)
  - Where the function crosses the y-axis
  - Where x equals 0

***Set x = 0 and solve for y**

Ex 1. $y = \frac{x^2 - 5}{2}$ $y = \frac{0^2 - 5}{2}$, $y = -\frac{5}{2}$ $(0, -\frac{5}{2})$

Ex. 2 $y = 4x^2 - 18x + 20$ $(0, 20)$

YOU TRY: **State the Domain and x & y int.**

Hint: Make a sketch of the graphs

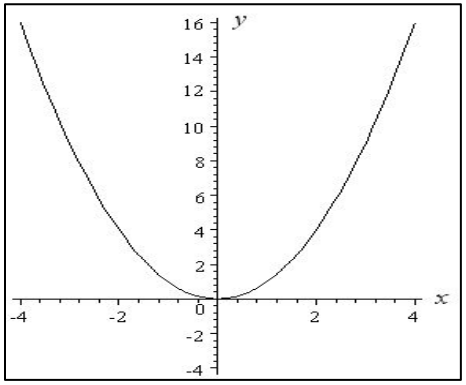
$$f(x) = x^2$$

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

$$f(x) = \frac{1}{x}$$

State the Domain and x & y int ANSWERS :

$f(x) = x^2$

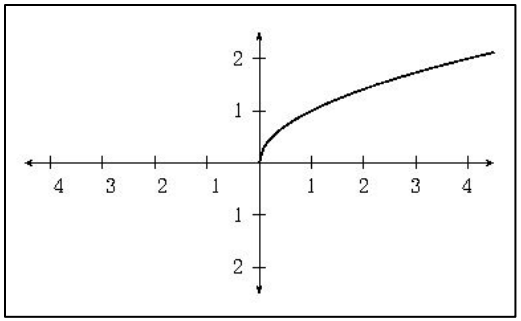


$Domain: (-\infty, \infty)$

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

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

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

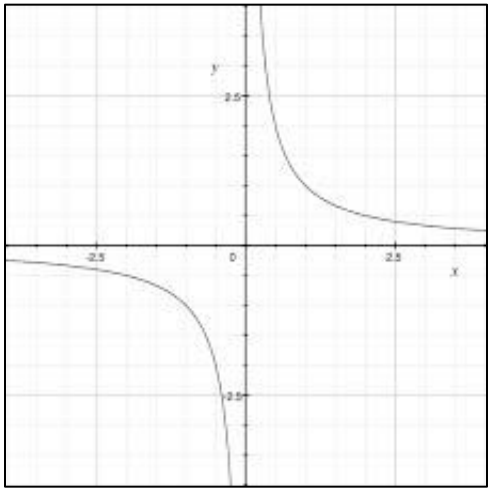


$Domain: [0, \infty)$

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

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

$f(x) = \dfrac{1}{x}$



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

$x-\text{int}: \textit{none}$

$y-\text{int}: \textit{none}$

Radical Examples: Find the Domain

$$f(x) = \sqrt{3x - 5} \qquad g(x) = \sqrt{3x^2 + 11x - 4}$$

Rational Examples: Find the Domain

$$f(x) = \frac{x - 3}{5x + 4} \qquad g(x) = \frac{2x - 3}{2x^2 + 11x - 21}$$

Radical Examples: Find the Domain ANSWERS

$f(x) = \sqrt{3x-5}$

$Domain: [\frac{5}{3}, \infty)$

$g(x) = \sqrt{3x^2+11x-4}$

$Domain: (-\infty, -4] \cup [\frac{1}{3}, \infty)$

NOTE: on ALL of these examples, if you used your calculator and just looked at integer values in the table or on the graph, you would NOT get the right answer because the answer includes fractions.

We need another way….

Rational Examples: Find the Domain ANSWERS

$$f(x)=\frac{x-3}{5x+4}$$

$$Domain:(-\infty,-\frac{4}{5})\cup(-\frac{4}{5},\infty)$$

$$g(x)=\frac{2x-3}{2x^2+11x-21}$$

$$Domain:(-\infty,-7)\cup(-7,\frac{3}{2})\cup(\frac{3}{2},\infty)$$

NOTICE: ALSO on ALL of these examples, if you used your calculator and just looked at integer values in the table or on the graph, you would NOT get the right answer because the answer includes fractions.

We need another way….

Square Root Functions

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

Expression under the square root symbol, must be **positive.**

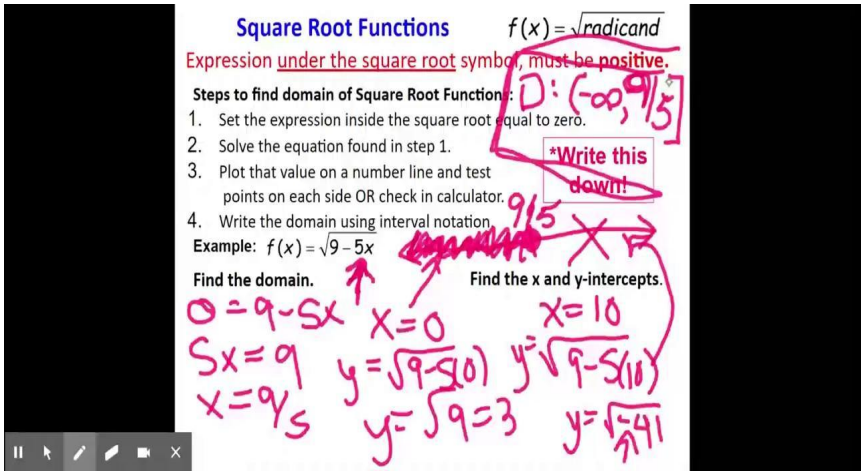
Steps to find domain of Square Root Functions:

1. Set the expression inside the square root equal to zero.
2. Solve the equation found in step 1.
3. Plot that value on a number line and test points on each side OR check in calculator.
4. Write the domain using interval notation.

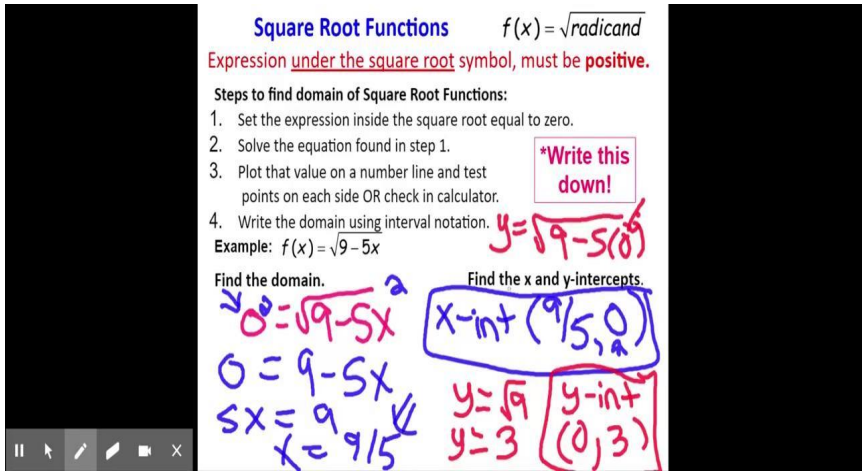
***Write this down!**

Example: $f(x) = \sqrt{9 - 5x}$

Find the domain.



Find the x and y-intercepts.



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***Write this down!**

Example:

$$f(x) = \sqrt{9 - 5x}$$

$$9 - 5x = 0$$

$$9 = 5x$$

$$x = \frac{9}{5}$$

Find the domain.

ANSWERS

$$Domain: \ (-\infty, \frac{9}{5}]$$

Find the x and y-intercepts.

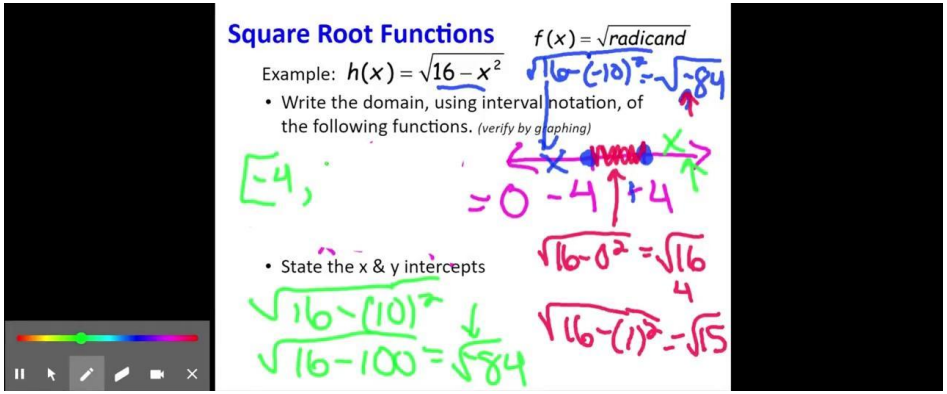
$$x-\text{int}: (\frac{9}{5}, 0) \qquad y-\text{int}: (0, 3)$$

Square Root Functions

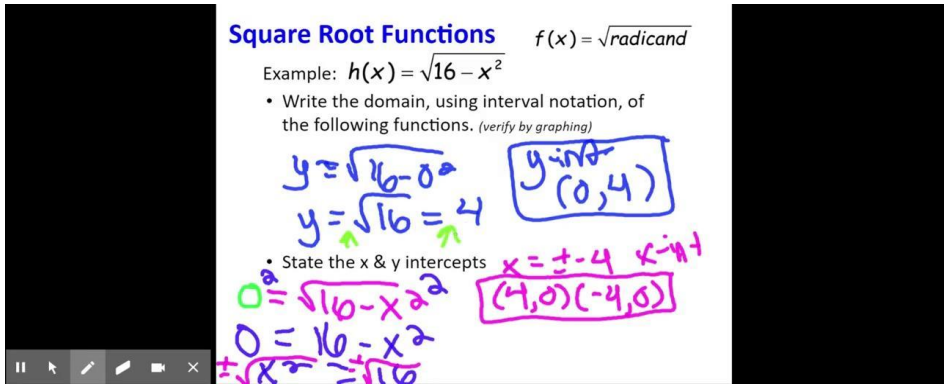
$$f(x) = \sqrt{radicand}$$

Example: $h(x) = \sqrt{16 - x^2}$

- Write the domain, using interval notation, of the following functions. *(verify by graphing)*



- State the x & y intercepts



Square Root Functions

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

ANSWERS

Example: $h(x) = \sqrt{16 - x^2}$

- Write the domain, using interval notation, of the following functions. *(verify by graphing)*
- State the x & y intercepts

$$Domain: \ [-4, 4]$$

$$x-\text{int}: (-4, 0) \ and \ (4, 0)$$

$$y-\text{int}: (0, 4)$$

Square Root Functions

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

You Try!

- Write the domain, using interval notation, of the following functions. *(verify by graphing)*
- State the x & y intercepts

$$f(x) = \sqrt{2x + 7}$$

$$h(x) = \sqrt{x^2 - 9}$$

Square Root Functions

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

You Try ANSWERS!

- Write the domain, using interval notation, of the following functions. *(verify by graphing)*
- State the x & y intercepts

$$f(x) = \sqrt{2x + 7}$$

$$Domain: \left[-\frac{7}{2}, \infty\right)$$

$$x-\text{int}: \left(-\frac{7}{2}, 0\right)$$

$$y-\text{int}: (0, \sqrt{7})$$

$$h(x) = \sqrt{x^2 - 9}$$

$$Domain: (-\infty, -3] \cup [3, \infty)$$

$$x-\text{int}: (-3, 0), (3, 0)$$

$$y-\text{int}: None$$

Rational Functions

$$f(x) = \frac{numerator}{denominator}$$

Expression in the denominator can NOT be equal to **zero**.

Steps to find domain of Rational Functions:

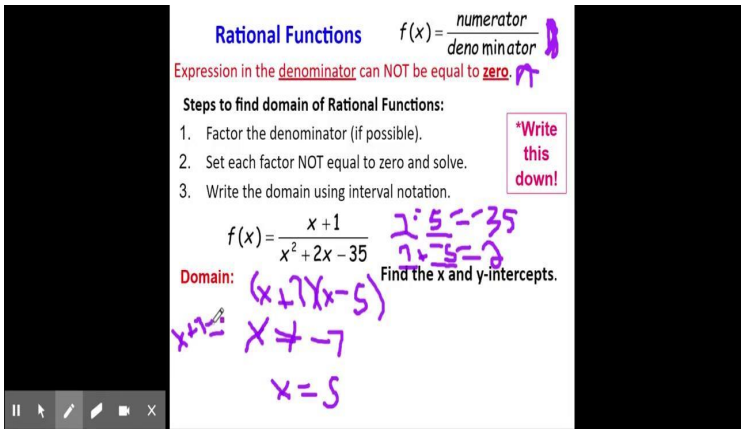
1. Factor the denominator (if possible).
2. Set each factor NOT equal to zero and solve.
3. Write the domain using interval notation.

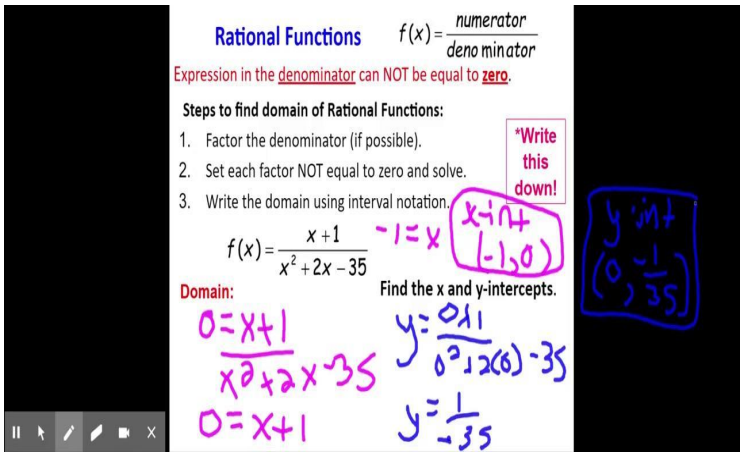
***Write this down!**

$$f(x) = \frac{x+1}{x^2+2x-35}$$

Domain:

Find the x and y-intercepts.





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***Write this down!**

$$f(x) = \frac{x+1}{x^2+2x-35}$$

ANSWERS

Find the x and y-intercepts.

$x-\text{int}: (-1, 0)$

$y-\text{int}: (0, -1/35)$

Domain:

$$(-\infty,-7)\cup(-7,5)\cup(5,\infty)$$

Domain of Functions

You Try!

$$f(x) = \frac{numerator}{denominator}$$

- Write the domain, using interval notation, of the following functions. *(verify by graphing)*
- State the x & y intercepts

$$a.\ g(x) = \frac{8}{2x + 12}$$

$$b.\ f(x) = \sqrt{x^2 - 8x + 15}$$

$$c.\ k(x) = \frac{7}{x^2 - 16}$$

Domain of Functions

$$f(x) = \frac{numerator}{denominator}$$

You Try! ANSWERS

- Write the domain, using interval notation, of the following functions. *(verify by graphing)*
- State the x & y intercepts

$$a.\ g(x) = \frac{8}{2x + 12}$$

$Domain:\ (-\infty, -6) \cup (-6, \infty)$

$x-\text{int}:\ None$

$y-\text{int}: (0, \frac{2}{3})$

$$b.\ f(x) = \sqrt{x^2 - 8x + 15}$$

$Domain:\ (-\infty, 3] \cup [5, \infty)$

$x-\text{int}: (3, 0),\ (5,\ 0)$

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

$$c.\ k(x) = \frac{7}{x^2 - 16}$$

$Domain:\ (-\infty, -4) \cup (-4, 4) \cup (4, \infty)$

$x-\text{int}:\ None$

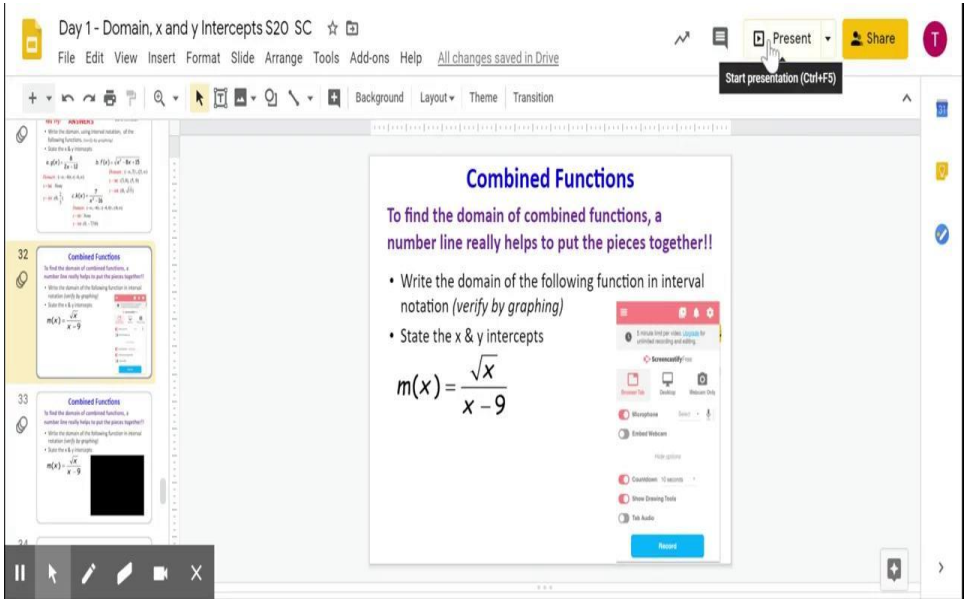
$y-\text{int}: (0,\ -7/16)$

Combined Functions

To find the domain of combined functions, a number line really helps to put the pieces together!!

- Write the domain of the following function in interval notation *(verify by graphing)*
- State the x & y intercepts

$$m(x) = \frac{\sqrt{x}}{x-9}$$



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Combined Functions

To find the domain of combined functions, a number line really helps to put the pieces together!!

- Write the domain of the following function in interval notation *(verify by graphing)*
- State the x & y intercepts

$$m(x) = \frac{\sqrt{x}}{x-9}$$

ANSWERS

$$Domain: [0, 9) \cup (9, \infty)$$

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

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

Practice

- Find the domain and x & y intercepts of…

$$f(x)=\frac{1}{x}+\frac{5}{x-3}$$

$$h(x)=\frac{\sqrt{4-x^2}}{x-3}$$

$$g(x)=\frac{\sqrt{4-x}}{(x+1)(x^2+1)}$$

Practice ANSWERS

- Find the domain and x & y intercepts of…

$$f(x)=\frac{1}{x}+\frac{5}{x-3}$$

$Domain:\ (-\infty,0)\cup(0,3)\cup(3,\infty)$

$x-\text{int}:(0.5,\ 0)$

$y-\text{int}:None$

$$h(x)=\frac{\sqrt{4-x^2}}{x-3}$$

$Domain:\ [-2,\ 2]$

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

$y-\text{int}:(0,\ -\frac{2}{3})$

$$g(x)=\frac{\sqrt{4-x}}{(x+1)(x^2+1)}$$

$Domain:\ (-\infty,-1)\cup(-1,4]$

$x-\text{int}:(4,\ 0)$

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

Homework Day 1

- Packet p. 1