Name:_____ Date:_____

# Notes: Domain and Range 2.0

Do Now:

1) Find the value(s) of $x$ that will make the following function undefined.

$$f(x) = \frac{2}{x+5}$$

$x + 5 = 0$

$x = -5$

2) Find all the real values of $x$ that will make the following function imaginary.

$$f(x) = \sqrt{2x - 20}$$

$2x - 20 < 0$

$+20 \quad +20$

$\frac{2x}{2} < \frac{20}{2}$

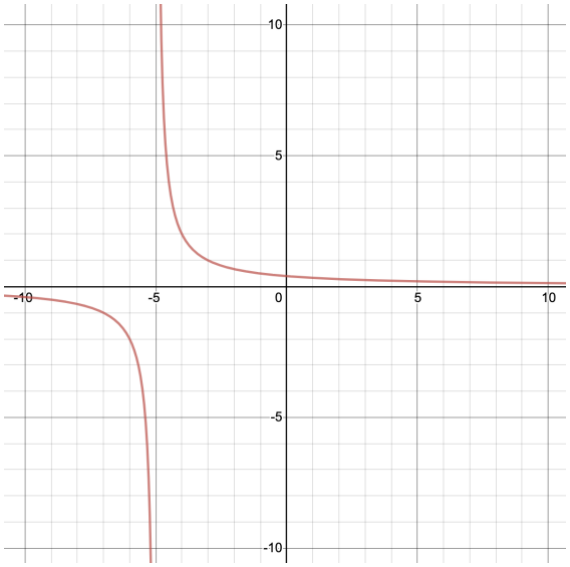
$x < 10$

# What Should I Be Able to Do?

**- I can algebraically find the domain and range of linear and square root equations.**
**- I can algebraically find the domain of rational equations.**

**Let's take a look at the graphs of the functions in our Do Now:**

1) $f(x) = \frac{2}{x+5}$




How does the graph of $f(x) = \frac{2}{x+5}$ show us the domain of the function?

There is no point on the graph when $x = -5$.

How does the (x,y) table of $f(x) = \frac{2}{x+5}$ support our findings?

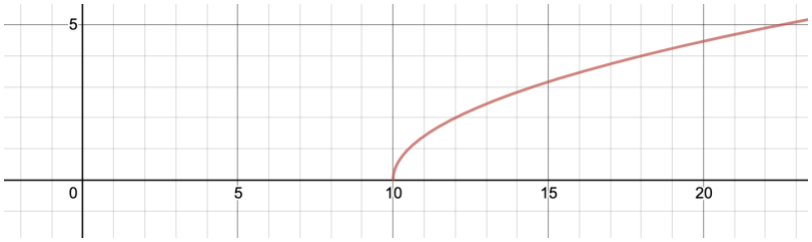
When $x = -5$, the x,y table has an ERROR message.

What is the range of $f(x) = \frac{2}{x+5}$?

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

All real numbers such that $y \neq 0$.

2) $f(x) = \sqrt{2x - 20}$




How does the graph of $f(x) = \sqrt{2x - 20}$ show us the domain of the function?

There are no graphed points for $x < 10$.

How does the (x,y) table of $f(x) = \sqrt{2x - 20}$ support our findings?

For all $x < 10$, the y values have an ERROR message.

What is the range of $f(x) = \sqrt{2x - 20}$?

$[0, \infty)$

Determine the domain of the function $f(x) = \frac{3x}{x+1}$.

$x+1 \neq 0$

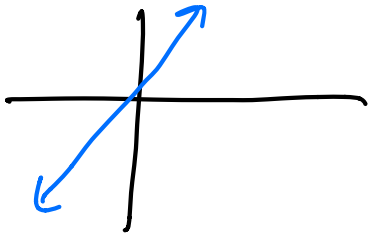
$-1 \quad -1$

$x \neq -1$

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

All real numbers such that $x \neq -1$.

Determine the domain and range of the function $f(x) = 2x + 1$.



Domain: All real numbers

Range: All real numbers.

Determine the domain and range of the function $f(x) = \sqrt{x-3}$.

$x - 3 \geq 0$

$+3 \quad +3$

$x \geq 3$

Domain: All real numbers such that $x \geq 3$.

Range: All real numbers such that $y \geq 0$.

Determine the domain of the function $f(x) = \frac{1}{\sqrt{x-3}}$.

$\sqrt{x-3} \neq 0$ but also $x - 3 \geq 0$

Combine both stipulations to get

$x - 3 > 0$

$+3 \quad +3$

$x > 3$

Domain: All real numbers such that $x > 3$.

Determine the domain of the function $f(x) = \frac{\sqrt{x-2}}{x-7}$.

$x - 2 \geq 0$

$+2 \quad +2$

$x \geq 2$

$x - 7 \neq 0$

$+7 \quad +7$

$x \neq 7$

Must satisfy both stipulations

$[2, 7) \cup (7, \infty)$

Determine the domain of the function $f(x) = \frac{\sqrt{x+5}}{\sqrt{x-4}}$.

$x + 5 \geq 0$

$-5 \quad -5$

$x \geq -5$

$x - 4 > 0$

$+4 \quad +4$

$x > 4$

Must satisfy both stipulations

$(4, \infty)$

# Checkpoint:

Find the domain and range of each function.

1) $f(x) = \sqrt{x + 13.5}$

$x + 13.5 \geq 0$

$x \geq -13.5$

D: $x \geq -13.5$

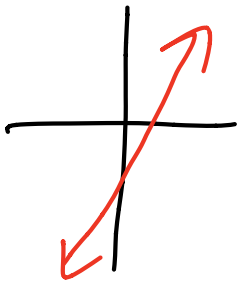
R: $y \geq 0$

2) $2y - 14x = -\frac{8}{7} + 19x$

$+14x \quad +14x$

$\frac{2y}{2} = \frac{-\frac{8}{7} + 23x}{2}$

$y = \frac{23}{2}x - \frac{8}{14}$



D: All real numbers

R: All real numbers

Find the domain of each function.

3) $f(x) = \frac{x-7}{x+14}$

$x + 14 \neq 0$

$-14 \quad -14$

$x \neq -14$

All real numbers such that $x \neq 14$

$(-\infty, 14) \cup (14, \infty)$ or

4) $f(x) = \frac{3x-4}{\sqrt{4x-23}}$

$4x - 23 > 0$

$4x > 23$

$x > 5.75$

All real numbers such that $x > 5.75$

or $(5.75, \infty)$

5) $f(x) = \frac{\sqrt{x}}{x-6}$

$\sqrt{x} \rightarrow x \geq 0$

$x - 6 \neq 0$

$x \neq 6$

Put these together!

$[0, 6) \cup (6, \infty)$

6) $f(x) = \frac{\sqrt{x-2}}{\sqrt{x+1}}$

$x - 2 \geq 0$

$x \geq 2$

$x + 1 > 0$

$x > -1$

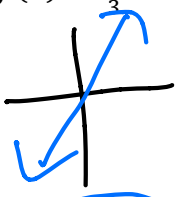
Put these together!

$x \geq 2$

# Success Criteria

**- I can algebraically find the domain and range of linear and square root equations.**
Find the domain and range of each function.

1) $f(x) = \frac{14}{3}x - 1$



D: $\mathbb{R}$
R: $\mathbb{R}$

2) $f(x) = \sqrt{3x + 20}$

$3x + 20 \geq 0$
$3x \geq -20$
$x \geq -\frac{20}{3}$

D: $x \geq -\frac{20}{3}$
R: $y \geq 0$

**- I can algebraically find the domain of rational equations.**
Find the domain of each function.

1) $f(x) = \frac{3x}{5x-6}$

$5x - 6 \neq 0$
$5x \neq 6$
$x \neq \frac{6}{5}$

D: All real numbers excluding $\frac{6}{5}$.

2) $f(x) = \frac{x-1}{\sqrt{6x+15}}$

$6x + 15 > 0$
$6x > -15$
$x > -\frac{15}{6}$

D: $\left(-\frac{15}{6}, \infty\right)$

Name:_____ Date:_____

# Classwork: Domain and Range 2.0

Find the domain and range of each function.

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

$\frac{3}{2}x + 5 \geq 0$

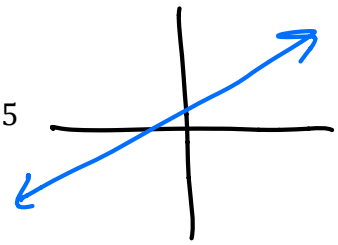
$\frac{3}{2}x \geq -5$

$x \geq -\frac{10}{3}$

D: $x \geq -\frac{10}{3}$

R: $y \geq 0$

2) $x = \frac{1}{3}y + 5$



D: $\mathbb{R}$

R: $\mathbb{R}$

Find the domain of each function.

3) $f(x) = \frac{x-7}{x}$

$x \neq 0$

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

4) $f(x) = \frac{2x+\frac{1}{3}}{\sqrt{x-15}}$

$x - 15 > 0$

$x > 15$

D: $x > 15$

5) $f(x) = \frac{\sqrt{x}}{\sqrt{x-7}}$

$x \geq 0$ $\quad x - 7 > 0$

$x > 7$

$x > 7$

6) $f(x) = \frac{\sqrt{x+8}}{2x-\frac{3}{4}}$

$x + 8 \geq 0$

$x \geq -8$

$2x - 0.75 \neq 0$

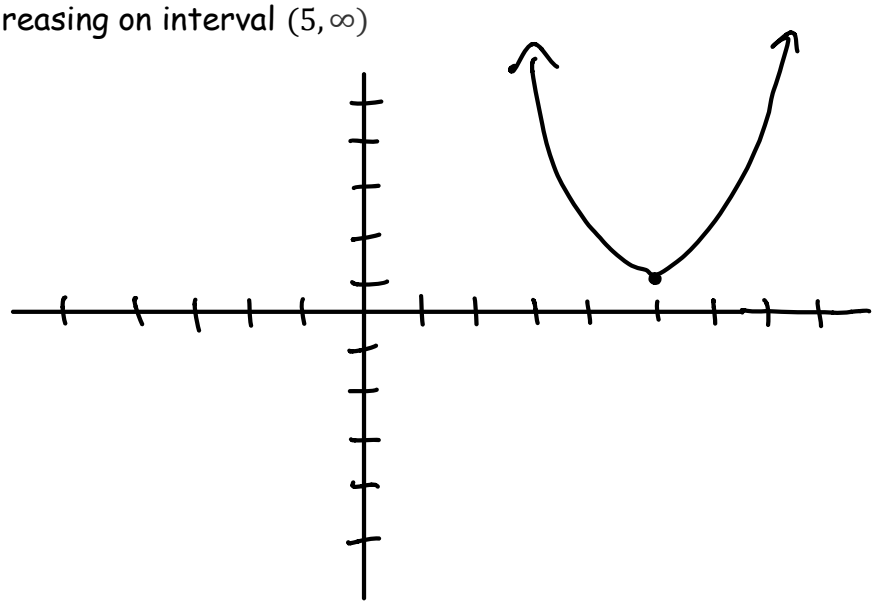
$2x \neq 0.75$

$x \neq 0.375$

$[-8, 0.375) \cup (0.375, \infty)$

7) Sketch the graph of $f(x)$ using the following information.

- $f(x)$ is decreasing on interval $(-\infty, 5)$
- $f(5) = 1$
- $f(x)$ is increasing on interval $(5, \infty)$



Completely simplify each expression.

8) $\left(\frac{74x^{-15}y^5z^{-1/6}}{4y^{-8}z^{8/6}}\right)^{-2}$

$\left(\frac{4y^{-8}z^{8/6}}{74x^{-15}y^5z^{-1/6}}\right)^2$

$\left(\frac{4}{74}\frac{1}{x^{-15}}\frac{y^{-8}}{y^5}\frac{z^{8/6}}{z^{-1/6}}\right)^2$

$\left(\frac{2}{37}x^{15}y^{-13}z^{3/2}\right)^2$

$\frac{4}{1369}x^{30}y^{-26}z^3$

$\frac{4x^{30}z^3}{1369y^{26}}$

9) $\sqrt[3]{-\frac{1}{343}x^{20}y^{33}z^{70}}$

$\sqrt[3]{\frac{-1}{343}}\sqrt[3]{x^{20}}\sqrt[3]{y^{33}}\sqrt[3]{z^{70}}$

$\frac{-1}{7}\sqrt[3]{x^{18}}\sqrt[3]{x^2}y^{11}\sqrt[3]{z^{69}}\sqrt[3]{z}$

$\frac{-1}{7}x^6\sqrt[3]{x^2}y^{11}z^{23}\sqrt[3]{z}$

$\boxed{\frac{-1}{7}x^6y^{11}z^{23}\sqrt[3]{x^2z}}$

10) $\frac{\left(\frac{1}{64}\right)^{-2/3}-(2)^{3/2}}{(-16)^{3/4}-(2)^{5/2}}$

$(64)^{2/3} = \sqrt[3]{64}^2 = 16$

$\sqrt{2^3} = \sqrt{8} = 2\sqrt{2}$

$\sqrt[4]{16}^3 = 2^3 = 8$

$\sqrt{2^5} = \sqrt{32} = 4\sqrt{2}$

$\frac{16-2\sqrt{2}}{8-4\sqrt{2}} = \frac{2(8-\sqrt{2})}{2(4-2\sqrt{2})} = \frac{8-\sqrt{2}}{4-2\sqrt{2}}\frac{(4+2\sqrt{2})}{(4+2\sqrt{2})}$

$\frac{32+16\sqrt{2}-4\sqrt{2}-2(2)}{16+8\sqrt{2}-8\sqrt{2}-4(2)} = \frac{28+12\sqrt{2}}{8} = \boxed{\frac{7+3\sqrt{2}}{2}}$

Solve each of the following equations.

11) $-3x^{\frac{3}{2}} = -24$

$\frac{-3}{-3} \quad \frac{-3}{-3}$

$x^{3/2} = 8$

$(x^{3/2})^{2/3} = (8)^{2/3}$

$x = (\sqrt[3]{8})^2$

$x = (2)^2$

$x = 4$

Check:

$-3(4)^{3/2} = -24$

$\sqrt{\ }\ -24 = -24$

12) $-\frac{4}{5}(x+9)^{\frac{5}{3}} + 1 = -79{,}999$

$\left(-\frac{5}{4}\right)\left[-\frac{4}{5}(x+9)^{5/3}\right] = \left[-80{,}000\right]\left(-\frac{5}{4}\right)$

$\left((x+9)^{5/3}\right)^{3/5} = (100{,}000)^{3/5}$

$x+9 = \sqrt[3]{10{,}000}^{3}$

$x+9 = (10)^3$

$x+9 = 1000$

$x = 991$

Check:

$-\frac{4}{5}(991+9)^{5/3} + 1 =$

$-79999$

13) Solve the following system of equations.

$$\begin{aligned} 3x + 7y + z &= -6 \\ -5x - 6y - 4z &= 33 \\ 4x - 3y + 9z &= -71 \end{aligned}$$

$\times 4$ and $\times(-9)$

$12x + 28y + 4z = -24$

$+\ -5x - 6y - 4z = 33$

$7x + 22y = 9$

$-27x - 63y - 9z = 54$

$+\ 4x - 3y + 9z = -71$

$-23x - 66y = -17$

$3(7x + 22y = 9)$

$-23x - 66y = -17$

$21x + 66y = 27$

$+\ -23x - 66y = -17$

$-2x = 10$

$x = -5$

$7(-5) + 22y = 9$

$-35 + 22y = 9$

$22y = 44$

$y = 2$

$3(-5) + 7(2) + z = -6$

$-15 + 14 + z = -6$

$-1 + z = -6$

$z = -5$

$x = -5$

$y = 2$

$z = -5$

14)

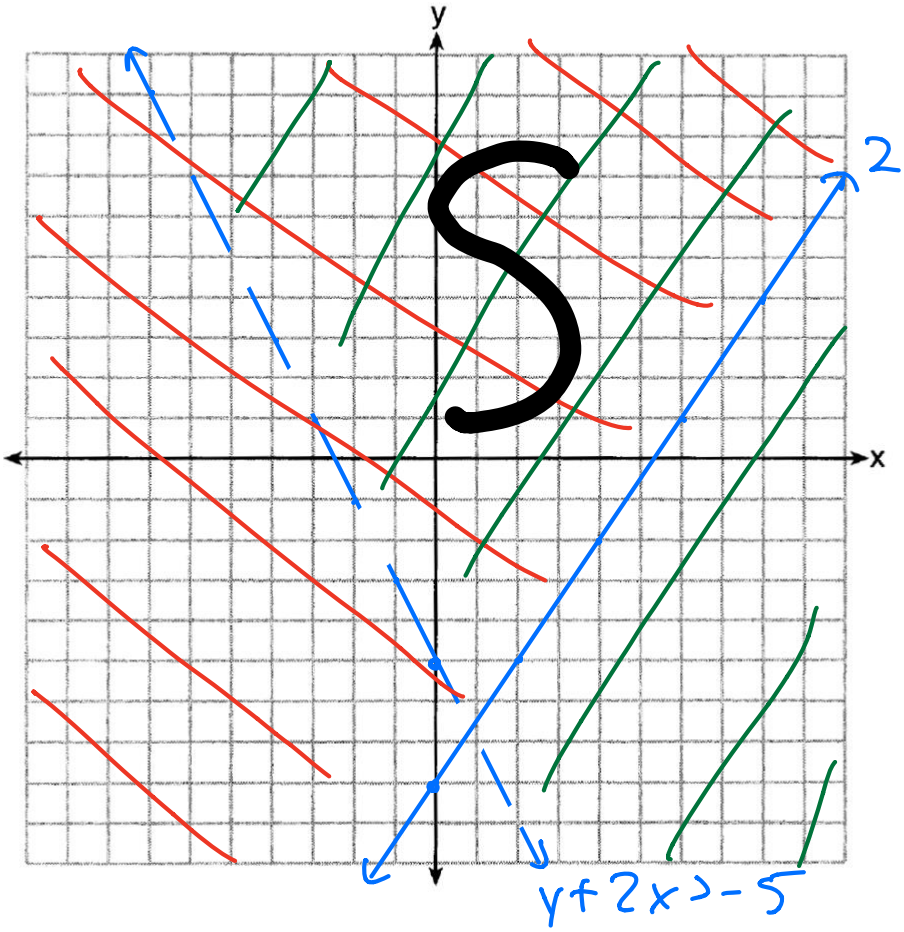
Graph the following system of inequalities on the set of axes below:

$2y \geq 3x - 16$

$y + 2x > -5$

$y \geq \frac{3}{2}x - 8$

$y > -2x - 5$




Based upon your graph, explain why (6,1) is a solution to this system and why (−6,7) is *not* a solution to this system.

(6,1) is a solution because it is in the double-shaded region on a solid line.

(-6,7) is not a solution because it is on a dotted line.

15)

Given that $f(x) = 2x + 1$, find $g(x)$ if $g(x) = 2[f(x)]^2 - 1$.

$2(2x+1)^2 - 1$

$2(2x+1)(2x+1) - 1$

$2(4x^2+2x+2x+1) - 1$

$2(4x^2+4x+1) - 1$

$8x^2+8x+2-1$

$\boxed{8x^2+8x+1}$

16) Completely simplify the following expression.

$$-5i^{102} + 6.25i^{41} + \frac{17}{3}i^{28} - i^{1,123}$$

$-5(-1) + 6.25(i) + \frac{17}{3}(1) - (-i)$

$5 + 6.25i + \frac{17}{3} + i$

$\boxed{\frac{33}{3} + 7.25i}$

17) Solve for $f$ in the equation below.

$$\frac{a+b}{c} = \frac{d+e}{f}$$

$\frac{f(a+b)}{a+b} = \frac{c(d+e)}{a+b}$

$\boxed{f = \frac{c(d+e)}{a+b}}$