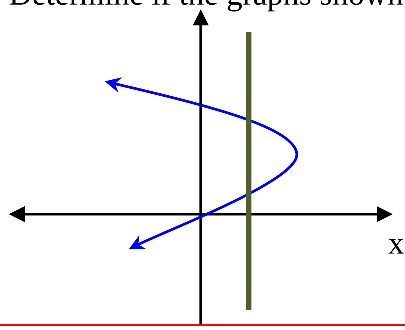
College Review Math
Section 4A

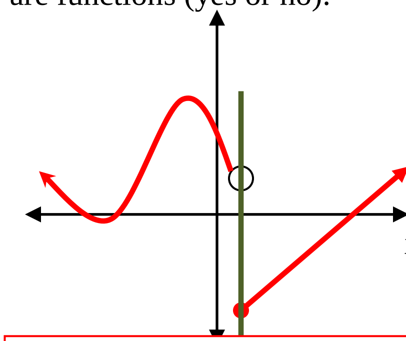
PROPERTIES OF FUNCTIONS

VERTICAL LINE TEST

Determine if the graphs shown below are functions (yes or no).



Since the green vertical line intersects the graph twice it *is not* a function.

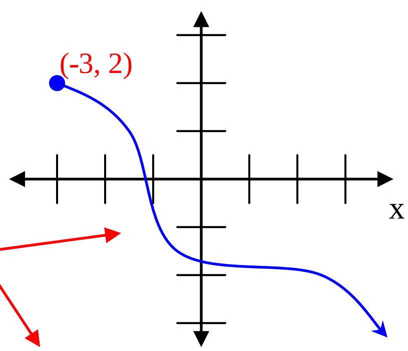


Since the vertical line cannot intersect the graph twice no matter where you draw it, the graph *is* a function.

Domain – the set of x-values for a function.

Range – the set of y-values for a function

For each graph shown, determine the domain and range.

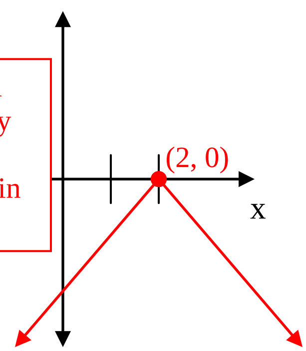


Since the graph moves infinitely to the right, the domain is "≥". Since it moves downward infinitely, the range is "≤".

D = $x \geq -3$

R = $y \leq 2$

Since the graph moves infinitely to the left & right, the domain is all real no.s



D = all real numbers

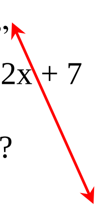
R = $y \leq 0$

Domain & Range for functions in "equation form"

For each function shown below, list the domain and range. It would be an excellent idea to picture what the graph would look like it first.

1) "linear"
$f(x) = -2x + 7$

Picture?

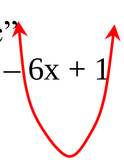


D = all real numbers

R = all real numbers

2) "quadratic"
$f(x) = 2x^2 - 6x + 1$

Picture?



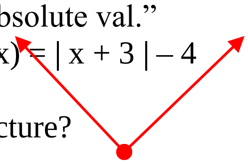
Vertex: use $-b/2a$
$x = -(-6) / 2(2) = 1.5$
$y = \text{(plug in)} = -3.5$

D = all real numbers

R = $y \geq -3.5$

3) "absolute val."
$g(x) = |x + 3| - 4$

Picture?



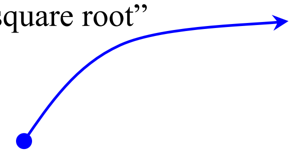
(-3, -4)

D = all real numbers

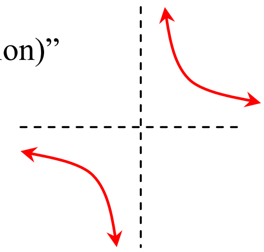
R = $y \geq -4$

NEW GRAPHS

"square root"



"rational (fraction)"



Find the domain and range for the "new" functions.
Unfortunately, picturing them won't help that much.

4) $f(x) = \sqrt{3x-9}$

Since negative square roots yield imaginary numbers, the part of the equation inside the root mustn't be negative, or…

$3x - 9 \geq 0$
$3x \geq 9$
$x \geq 3$

plug 3 in to get the range

$\sqrt{3(3)-9}$
$= \sqrt{9-9}$
$= 0$

D = $x \geq 3$

R = $y \geq 0$

5) $h(x) = \dfrac{5x}{x^2 - 13x + 42}$

$h(x) = \dfrac{5x}{(x-7)(x-6)}$

$x \neq 7$ *and* $x \neq 6$

Since any other number besides 6 & 7, if plugged in, can be computed the domain is…

D = all real numbers, $x \neq 6,7$

R = all real numbers (R)*

* Technically, there is a $y \neq$ number for the range as well. Since you have not been taught how to find it, and your stupid book only asks you for the domain on these anyway, I'll just allow you to write "Real no.s" and we'll count it!

Need more? Tricky, tricky.

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

$4 - x^2 \geq 0$ must be solved using sign analysis.
$(2 - x)(2 + x) \geq 0$, the roots are ± 2

(-) | -2 | (+) | 2 | (-)

Test (-3): (+)(-) = (-)
Solution to $4 - x^2 \geq 0$ is $\{ -2 \leq x \leq 2 \}$

D = $-2 \leq x \leq 2$

R = $0 \leq y \leq 2$

Since $4 - x^2$ is a quadratic, the max. y-value can be found using $x = -b/2a$, then plugging the x-value into the original function to find y. The minimum value for a $\sqrt{\ }$ is always 0.

6) $f(x) = \dfrac{2x+5}{4x^2 - 25}$

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

Even though the $(2x + 5)$'s can be cancelled, the undefined values are still both -5/2 & +5/2.

D = all real numbers, $x \neq \pm 5/2$

R = all real numbers (R)*