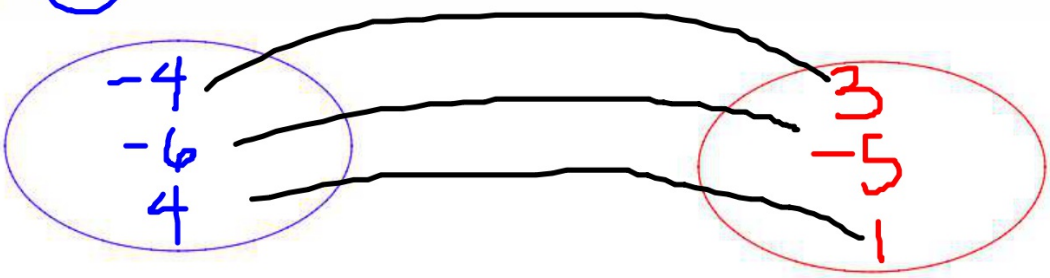
AM: Domain and range, relations and functions

1. Find the domain of the relation $\{(-4, 3), (-6, -5), (4, 1)\}$.

[A] $\{-4, -6, 4\}$ [B] $\{3, -5, 4\}$ [C] $\{3, -5, 1\}$ [D] $\{-4, -6, 1\}$

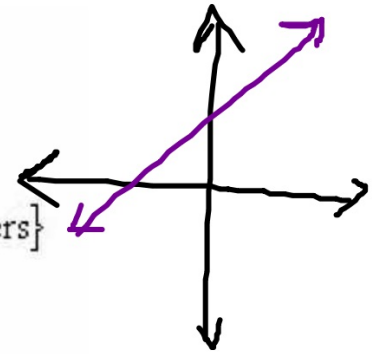


LO: The domain is the set of numbers .
{ -4, -6, 4 }, because those are the input ,
or x values of the relation.

AM: Domain and range, relations and functions

Find the domain and range:

2. $\{(x, y) \mid y = 7 + x\}$



[A] $D = \{\text{all real numbers}\}$; $R = \{\text{all real numbers}\}$

[B] $D = \{-7 \le x \le 7\}$; $R = \{\text{all real numbers}\}$

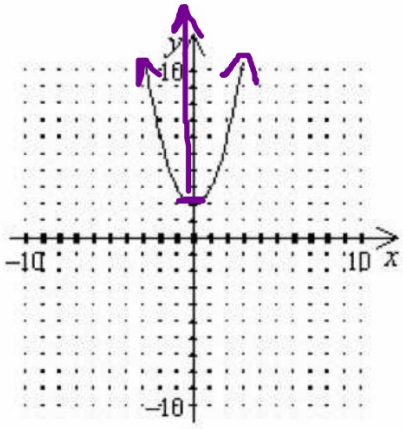
[C] $D = \{\text{all real numbers}\}$; $R = \{x \mid x \ge -7\}$

[D] $D = \{x \mid x \ge -7\}$; $R = \{\text{all real numbers}\}$

LO: The domain is the set of numbers {_____}, because those are the _____ or x values of the relation.

AM: Domain and range, relations and functions

3.



LO: The domain is the set of numbers {_____}, because those are the _____, or x values of the relation. The range is the set of numbers {_____}, because those are the _____, or y values of the relation.

[A] $D = \{y \mid y \leq 2\}$
$R = \{y \mid y \text{ is a real number}\}$

[B] $D = \{x \mid x \text{ is a real number}\}$
$R = \{y \mid y \text{ is a real number}\}$

[C] $D = \{x \mid x \text{ is a real number}\}$
$R = \{y \mid y \geq 2\}$

[D] $D = \{x \mid x > 2\}$
$R = \{y \mid y > 2\}$

Agreement

Unless we are dealing with a model that necessitates a restricted domain, we will assume that the domain of a function defined by an algebraic expression is the same as the domain of the algebraic expression, the implied domain.

For models, we will use a domain that fits the situation, the relevant domain.

Copyright © 2007 Pearson Education, Inc. Publishing as Pearson Addison-Wesley

Process for Finding a Domain

- Look at the functions for things that cause mathematical problems.
  - Do I have any square roots? (Can't be negative)
  - Do I have a denominator? (Can't be zero)
- Set up equation/inequality
  - For square roots, the radicand ≥ 0
  - For fractions, the denominator $= 0$
- Write answer using interval notation
  - *Remember you can put intervals together by writing a U between them (U means 'union')

Copyright © 2007 Pearson Education, Inc. Publishing as Pearson Addison-Wesley

Example Finding the Domain of a Function

Find the domain of the function.

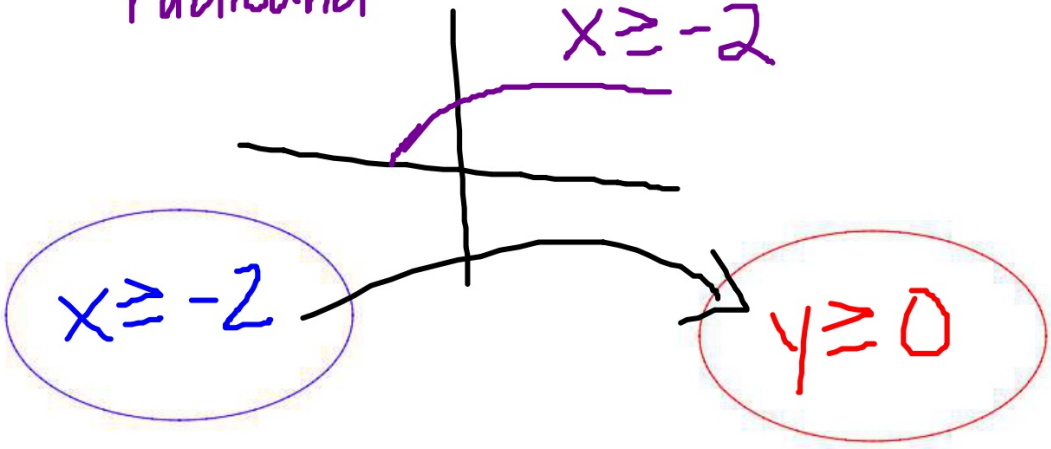
$f(x) = \sqrt{x+2}$

radicand

$x + 2 \geq 0$

$-2 \quad -2$

$x \geq -2$



Copyright © 2007 Pearson Education, Inc. Publishing as Pearson Addison-Wesley

Example Finding the Domain of a Function

Find the domain of the function.

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

Solve algebraically:

The expression under a radical may not be negative.

$x + 2 \geq 0$

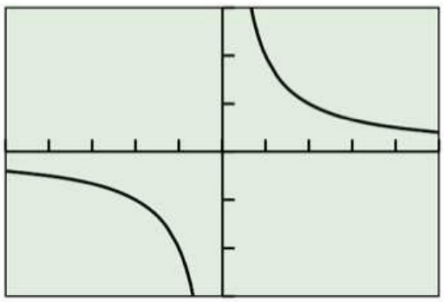
$x \geq -2$

The domain of f is the interval $[-2, \infty)$.

Copyright © 2007 Pearson Education, Inc. Publishing as Pearson Addison-Wesley

Example Finding the Range of a Function

Find the range of the function $f(x) = \frac{2}{x}$.



[–5, 5] by [–3, 3]

Solve Graphically:

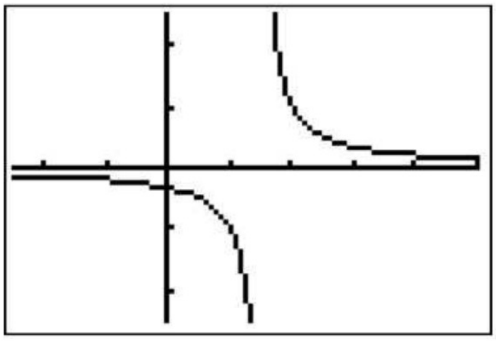
The graph of $y = \frac{2}{x}$ shows that the range is all real numbers except 0.

The range in interval notation is $(-\infty, 0) \cup (0, \infty)$.

Copyright © 2007 Pearson Education, Inc. Publishing as Pearson Addison-Wesley

Example Finding the Domain and Range of a Function

Find the domain and range of the function $f(x) = \dfrac{1}{2x-3}$.



Solve Graphically:

The graph of $y = \dfrac{2}{2x-3}$ shows that the domain is all real numbers except $\dfrac{3}{2}$.

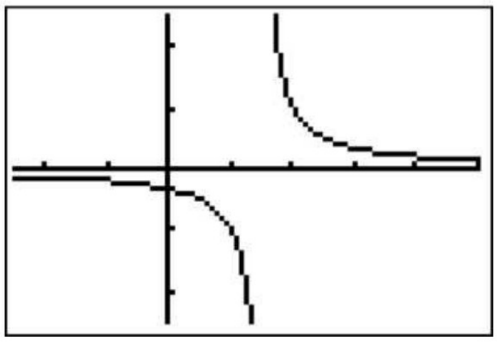
The domain in interval notation is $\left(-\infty, \dfrac{3}{2}\right) \cup \left(\dfrac{3}{2}, \infty\right)$.

Copyright © 2007 Pearson Education, Inc. Publishing as Pearson Addison-Wesley

Example Finding the Domain and Range of a Function

Find the domain and range of the function $f(x) = \dfrac{1}{2x-3}$.

How can we find the domain analytically, that means without looking at a graph or table?



Copyright © 2007 Pearson Education, Inc. Publishing as Pearson Addison-Wesley

Example Finding the Domain and Range of a Function

Find the range of the function $f(x) = \frac{1}{2x-3}$

$2x - 3 \neq 0$

$+3 \quad +3$

$\frac{2x}{2} \neq \frac{3}{2}$

$x \neq \frac{3}{2}$

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

$y \neq 0$

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

Copyright © 2007 Pearson Education, Inc. Publishing as Pearson Addison-Wesley