Algebra 3-4 Functions: Review, Domain/Range

Name: _____ Date: _____ Pd: _____

Functions: Review

What is a....?

Relation: _____

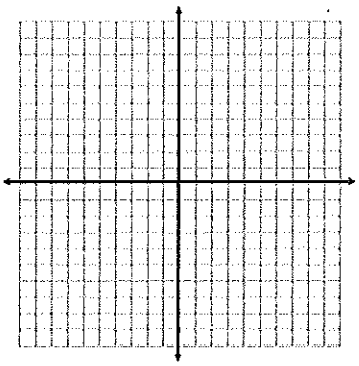
Function: _____

Domain: _____

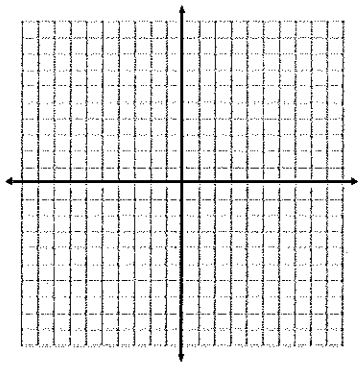
Range: _____

Draw a graph of a...:

a) relation that is a function



b) relation that is NOT a function



Function Notation f(x):

- Names the function and variable(s) used
- Examples: a) $f(x) = x + 1$ b) $g(y) = y^2 + 3$
  - Example a: function name is f; input variable is x; $f(-4) = -3$
  - Example b: function name is g; input variable is y; $g(2) = 7$
- Easy way to ask "given input x, what is the output f?"
- Helps tell the difference between more than one function on a graph

You try:

a) $f(x) = 4x^2 + x - 1$
Find f(-2)

b) $f(x) = 5x + 10$
Find f(0)

c) $f(x) = 5x + 10$
Find x such that f(x)=0

Algebra 3-4 Functions: Review, Domain/Range

Set Notation:

- *Set Builder Notation*:
  - Use set (curly) brackets
  - Declare the set of the variable (such as real number, integer)
    - If no declaration given, assume real numbers
  - Describe the condition of belonging in the set
  - Examples:

$\{x \in \Re \mid x > 3\}$

type of number — such that — conditions

a) All real numbers smaller than -2

$\{x \in \Re \mid x < -2\}$

b) All integers bigger than 5

$\{x \in Z \mid x > 5\}$

c) All real numbers between and including -4 and 5

$\{x \in \Re \mid -4 \leq x \leq 5\}$

d) All natural numbers smaller than 0 or greater than or equal to 10

$\{x \in N \mid x<0 \text{ or } x \geq 10\}$

e) All real numbers

$\{x \in \Re \mid x\}$

f) Empty set

$\{\}$ or ϕ

You try: Express in set builder notation...

a) The set of integers smaller than 10 but bigger than 0

b) All integers that are both even and odd

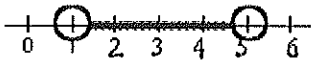
c) The solution to $-4x+10>-6$

- *Interval Notation*:
  - Indicates a connected set of numbers
  - For our purposes, unless otherwise stated, we are working with real numbers
  - Uses symbols ( ) and/or [ ]
  - ( ) indicate open intervals; the endpoint is not included (similar to <, >)
  - [ ] indicate closed intervals; the endpoint is included (similar to ≤, ≥)
  - Examples of interval notation:

Algebra 3-4 Functions: Review, Domain/Range

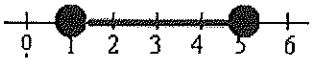
a) (1, 5)

open interval between 1 and 5; same as $1<x<5$



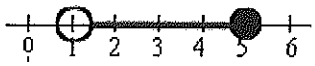
b) [1, 5]

closed interval between 1 and 5; same as $1\leq x\leq 5$



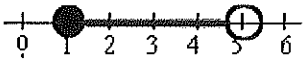
c) (1, 5]

same as $1<x\leq 5$



d) [1, 5)

same as $-1\leq x<5$



e) $(1, \infty)$

- non-ending intervals;
- same as $x > 1$
- **always** use (or) with ∞

f) $(-\infty, 5]$

- non-ending intervals;
- same as $x \leq 5$
- **always** use (or) with ∞

f) All real numbers

$(-\infty, \infty)$

g) To express: $x<10$ or $x\geq 13$ use set union symbol "$\cup$"

$(-\infty, 10) \cup [13, \infty)$

h) All numbers except 0

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

You try: write the sets of numbers below in interval notation...

a) real numbers between and including -4 and 6

b) real numbers between 1 and 5, including the 1 but not including the 5

c) the solution to $-3x+2\leq 20$

d) numbers less than or equal to 5 or greater than 10

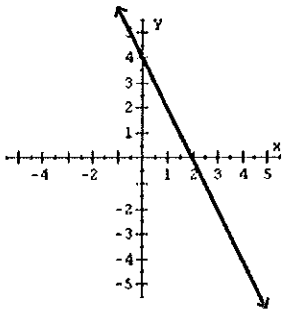
e) numbers less than 2, or between 7 and 12, not including 7 but including 12

Algebra 3-4 Functions: Review, Domain/Range

Domain and Range

Determine if the following relations are functions. Then describe the *domain* and *range* of the relations in set builder and interval notations:

a)

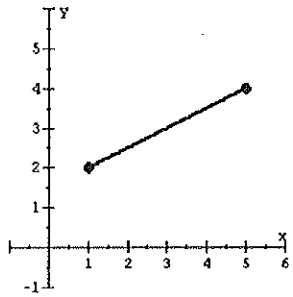


Function?_____

Domain_____

Range_____

b)

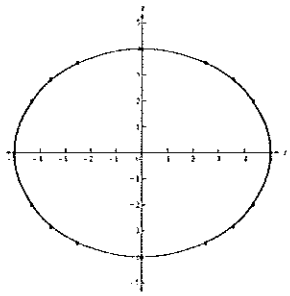


Function?_____

Domain_____

Range_____

c)

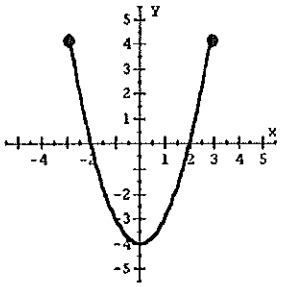


Function?_____

Domain_____

Range_____

d)

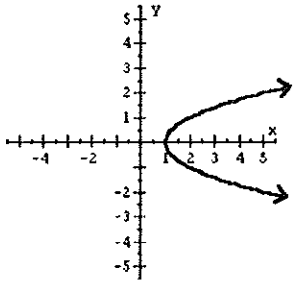


Function?_____

Domain_____

Range_____

e)

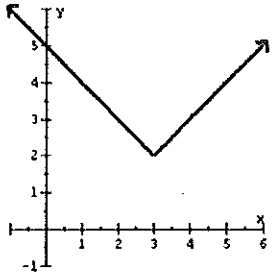


Function?_____

Domain_____

Range_____

f)



Function?_____

Domain_____

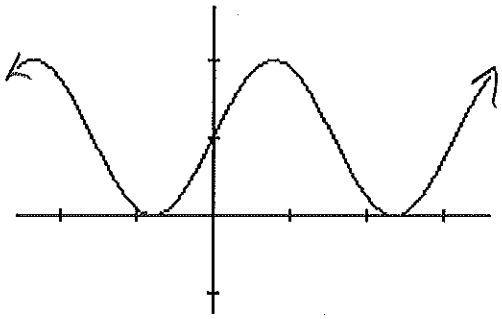
Range_____

- The graphs above are **continuous**.
  - This means: _____
- Functions can be **discontinuous**.
  - This means: _____
  - Discontinuous functions may have **holes** or **asymptotes** or other gaps or jumps.

Algebra 3-4 Functions: Review, Domain/Range

Consider these graphs. Are the functions continuous? Find the domain and range for each function in interval notation.

a)

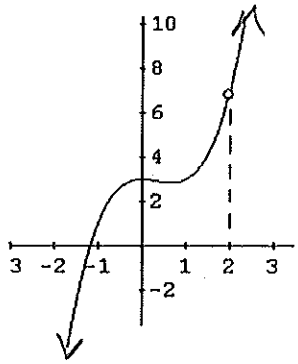


Continuous?_____

Domain_____

Range_____

b)

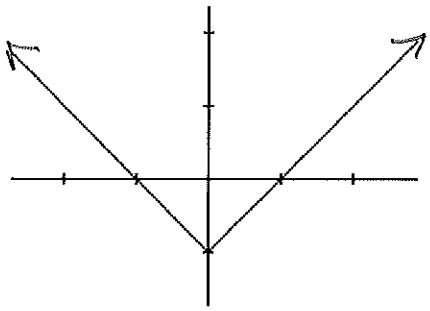


Continuous?_____

Domain_____

Range_____

c)

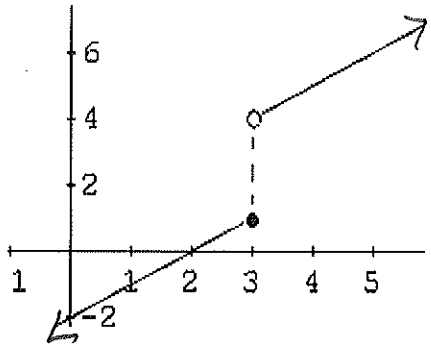


Continuous?_____

Domain_____

Range_____

d)

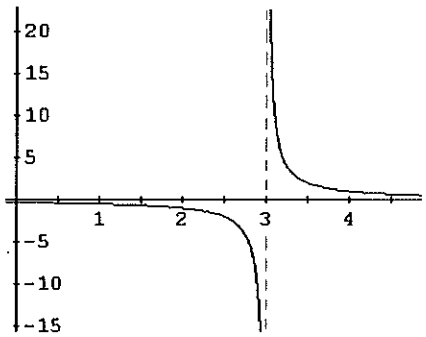


Continuous?_____

Domain_____

Range_____

e)

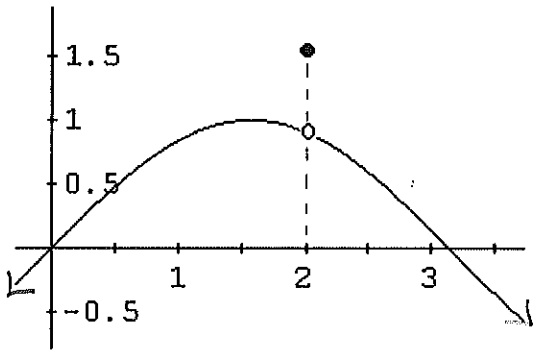


Continuous?_____

Domain_____

Range_____

f)



Continuous?_____

Domain_____

Range_____

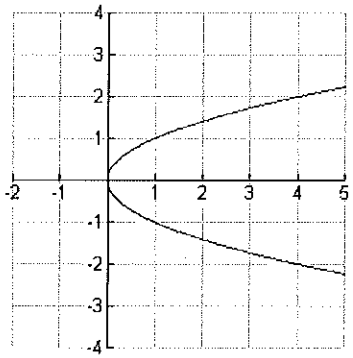
Restricted Domains/Ranges

- Sometimes domains are restricted or changed; the domains in the above examples are restricted to exclude values that would not make it a function
- Sometimes we restrict the domain when certain points would not describe a function
- Examples:

a) Restricting Range...

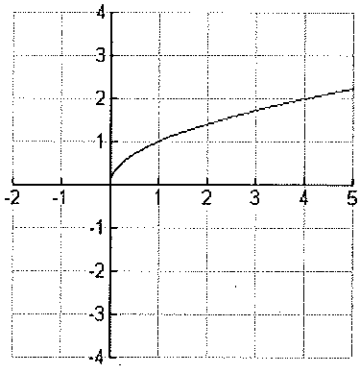
$y^2 = x$

Function? _____



To make it a function, how can we restrict the range?

Restricting Range: only positive values

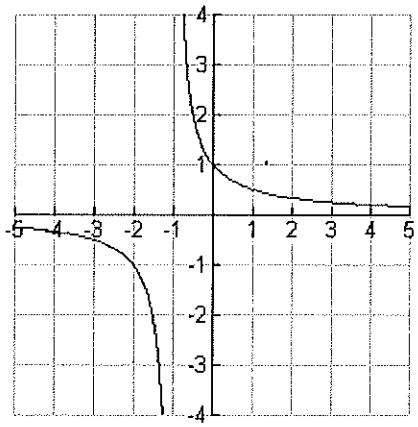


What is the equation for this function?

y = _____

b) Restricting Domain...

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



How do we restrict the domain for this function?

Hint: Remember, that we can never have a denominator with value 0 (why not?).

You try: Restrict the domain and/or range to make the relation a function...

a) $x^2 + y^2 = 16$

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

Algebra 3-4 Functions: Review, Domain/Range

Intercepts

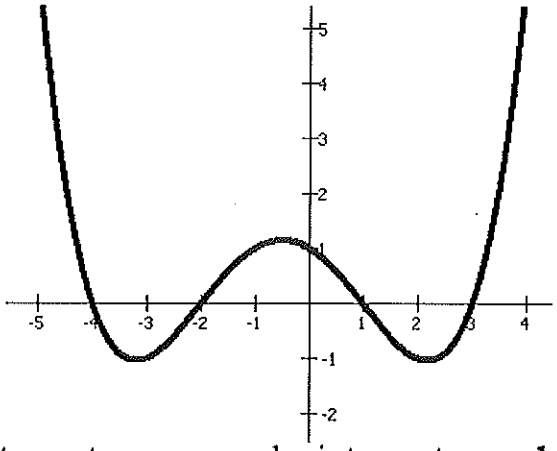
An x-intercept is _____

A y-intercept is _____

A zero of a function is _____

Find the x-intercept(s), y-intercept(s), and zero(s) of the relation below:

x-intercept(s)_____
y-intercept(s)_____
zero(s) _____



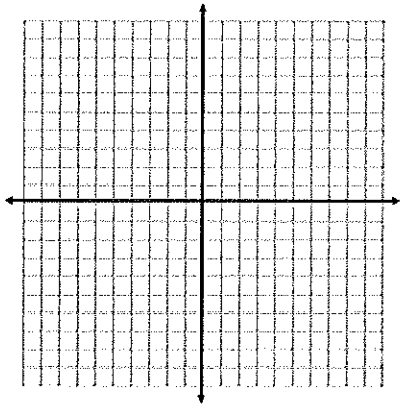
Describe how to find the x-intercepts, zeros, and y-intercepts **graphically**:

Describe how to find the x-intercepts, zeros, and y-intercepts **algebraically**:

Find the zero(s) and y-intercept(s) of the function graphically and algebraically:

$f(x) = x^2 - 2x - 3$ **ZERO(S)**_____ **; Y-INTERCEPT(S)** _____

Find graphically:



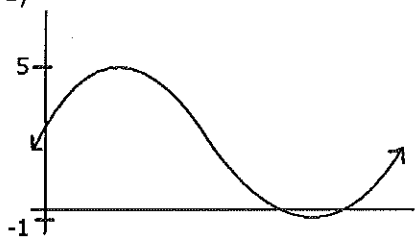
Find algebraically:

Algebra 3-4 Functions: Review, Domain/Range

Practice:

For the given relations, determine whether the relation is a function, is continuous, and find the domain and range in set builder and interval notation.

1)



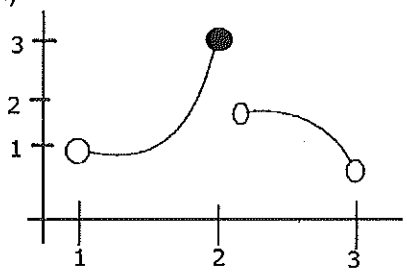
Function?_____

Continuous?_____

Domain_____

Range_____

2)



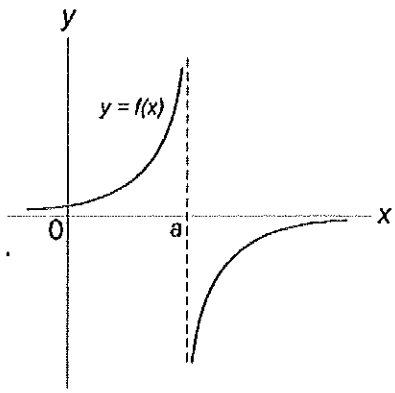
Function?_____

Continuous?_____

Domain_____

Range_____

3)



Function?_____

Continuous?_____

Domain_____

Range_____

Restrict the domain to make the relation a function (assume real numbers).

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

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

6) $f(x) = \dfrac{1}{\sqrt{x-1}}$

Find the zero(s) and y-intercept(s) of the function graphically and algebraically.

7) $f(x) = -x^2 + 5x + 6$