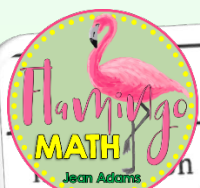


Precalculus Honors

Function Basics



Finding the Domain of a Function

If f is defined by an equation and no domain is specified, then the domain will be the largest set of real numbers for which the value of $f(x)$ is a real number. Exclude any real numbers from a function's domain that cause division by zero or that result in an even root of a negative number, that is, an imaginary number.

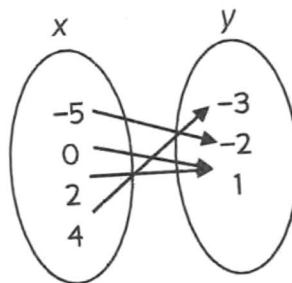
EX #4: Find the domain and range in each of the relations below.

A. $\{(8, -3), (-2, 4), (1, 8), (8, 6), (2, 7)\}$

domain: $\{8, -2, 1, 2\}$

range: $\{-3, 4, 8, 6, 7\}$

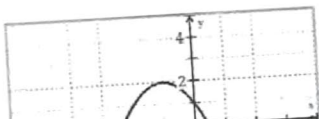
B.



domain:
 $\{-5, 0, 2, 4\}$

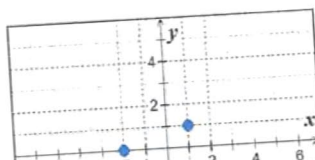
range:
 $\{-3, -2, 1\}$

C.



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

D.



domain:
 $\{-3, -2, 1\}$

Completely Editable

1.1

Lesson I: Function Basics

Relation vs. Function

VOCABULARY

A _____ is a set of ordered pairs.

A _____ is a special relation between two variables such that to each value of the independent variable, called the _____, there corresponds exactly one value of the dependent variable commonly known as the _____.

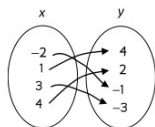
EX #1: Determine whether each relation represents a function. Justify.

- A. $\{(2,5), (3,-1), (-1,4), (2,3)\}$ B. The area of a circle is a function of the radius.

C.

Friend	Birthday
Andy	Sept 3
Ruth Ann	April 13
Liz	March 11
Ken	May 17
Sean	April 13

D.



Function Notation

SYMBOLICALLY

$f(x)$ read this as "f of x."

$f, g,$ and h are used to name functions

$y = f(x)$ the value of f at the number x

$f(2) = 9$ means $(2,9)$ is on the graph of f

In Algebra 2 we represented functions using tables, graphs, equations, mappings, and verbal descriptions. In our PreCalculus course, these ideas will be further developed. The concept, developed by the Harvard Calculus Consortium, known as the "Rule of Four" will strengthen your mathematical understanding.

THE RULE OF FOUR (G.N.A.W.) FOUR WAYS TO REPRESENT A FUNCTION

Graphically	by points on a coordinate plane where input values are on the horizontal axis and output values are on the vertical axis
Numerically	by a table or a set of ordered pairs that matches input values with output values
Algebraically	by an equation in two variables
Words	by verbally describing how the input variable is related to the output variable

Evaluating Functions

EX #2: Given the function $f(x) = 2x^2 - 3x$, evaluate

- A. $f(2)$ B. $f(x) + f(2)$
- C. $f(2x)$ D. $-f(x)$
- E. $f(-x)$ F. $f(x+2)$
- G. $f(x+h)$ H. $\frac{f(x+h) - f(x)}{h}, h \neq 0$

Implicit and Explicit Forms

When a function is defined by an equation in x and y , we say that the function is given **implicitly**. If it is possible to solve the equation for y in terms of x , such that $y = f(x)$, then we say that the function is stated **explicitly**. The explicit form of a function will be the required form when using graphing technology.

EX #3: Given implicitly-defined functions, solve each for y in terms of x . Then state whether the equation represents y as a function of x .

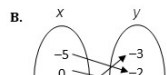
- A. $2x + 3y = 5$ B. $x^2 - 2y = 3$
- C. $xy = 1$ D. $x^2 + y^2 = 4$

Finding the Domain of a Function

If a function f is defined by an equation and no domain is specified, then the domain will be the largest set of real numbers for which the value of $f(x)$ is a real number. Exclude any real numbers from a function's domain that cause division by zero or that result in an even root of a negative number; that is, an imaginary number.

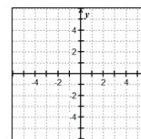
EX #4: Find the domain and range in each of the relations below.

- A. $\{(8,-3), (-2,4), (1,8), (8,6), (2,7)\}$

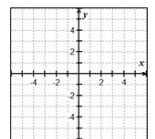


EX #5: Find the domain of each of the following functions. Then use a graphing calculator to verify your findings.

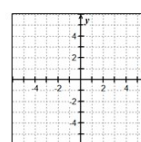
A. $x^2 - y^2 = 9$



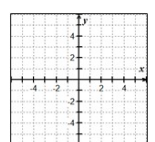
B. $f(x) = x^2 + 4x$



C. $g(x) = \frac{x}{x^2 - 4}$



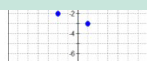
D. $h(x) = \sqrt{3 - 4x}$



Applications

EX #6: Teri is a sales-clerk at *Electronix Depot* who earns \$275 base pay plus \$15 for each item sold. Express her gross salary G as a function of the number x of items sold. Find her gross pay if she sells 12 items.

NOTES



1.1

Function Basics
Practice

Name _____

Date _____ Period _____

Problems 1 – 4, determine whether each relation represents a function. For each function, state the domain and range.

1. $\{(2,4), (-1,1), (0,3), (1,5)\}$

2. $\{(1,2), (2,2), (3,2), (4,2)\}$

Employee	Phone Number
Megan	783-4513
Thomas	781-0525
Kendall	423-1217 425-0981
Jordan	423-9765

x	3	5	7	3
y	-1	3	2	0

Problems 5 – 10, determine whether each equation represents a function.

5. $y = \frac{2}{x}$

6. $y = |x - 3|$

7. $x + y^2 = 4$

8. $y = \frac{x-2}{x^2-4}$

9. $y = \sqrt{2x - 1}$

10. $x^2 + y^2 = 9$

Problems 11 – 16, find the domain of each function.

11. $3x + y = 4$

12. $f(x) = x^2 - 2x + 3$

13. $g(x) = \frac{x^2}{x^2 + 1}$

14. $h(x) = \frac{x+1}{x^2-1}$

15. $g(x) = \frac{x^2-1}{x+2}$

16. $h(x) = \sqrt{2-x}$

Problems 17 – 20, Evaluate each function at the specified value of the independent variable and simplify.

17. $f(x) = 2x^2 - 3x + 4$

18. $f(x) = |x| - 2$

A. $f(-1)$

A. $f(-x)$

B. $-f(x)$

B. $f(x-1)$

C. $f(2x)$

C. $f(4x)$

19. $f(x) = \sqrt{x^2 - x}$

20. $f(x) = \frac{x}{x^2 + 1}$

A. $f(-1)$

A. $-f(x)$

B. $f(-x)$

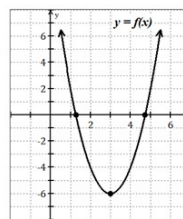
B. $f(x+1)$

C. $-f(x)$

C. $f(x+h)$

Problems 21 – 24, answer each question.21. If $f(x) = 2x^3 + Ax^2 + 4x - 3$ and $f(2) = 11$, what is the value of A ?22. If $f(x) = \frac{2x-B}{3x+4}$ and $f(-2) = \frac{7}{2}$, what is the value of B ?23. Write the area A of a square as a function of its perimeter P .24. Express the gross salary S of a person earning \$16 per hour as a function of the number h of hours worked.

Free Response Question

Given $f(x) = 2(x-3)^2 - 6$, answer each of the following:A. Find $f(2)$. Explain the meaning of your result in relation to the graph.B. What is $f(0)$? Does this value seem reasonable based on the graph of the function shown at right? Explain why or why not.C. The graph of $f(x)$ has two real zeros. Notice that a zero of the function occurs between $x = 4$ and $x = 5$. Use computations to justify why a zero of the function must exist at some x -value on this interval $4 \leq x \leq 5$.D. Solve $f(x) = -4$, explain the meaning in relation to the graph of f shown above.E. In general, explain the difference in the meaning when evaluating $f(a)$, and solving the equation $f(x) = a$.

Practice Sets

Lesson Warm-Ups

Name _____ Date _____ Period _____	
Lesson I.I: Function Basics Warm-Up # 1	
1. Evaluate the function $f(x) = -\sqrt{x-1} + 2$ $f(5)$ $f(x+1)$	2. State the domain of the function $g(x) = \sqrt{x+3}$
3. Determine whether the equation represents y as a function of x . $4x + y^2 = 16$	4. Determine whether the equation represents y as a function of x . $y = \sqrt{x} - 1$

Name _____ Date _____ Period _____	
Lesson I.I: Function Basics Warm-Up # 2	
1. Evaluate the function $f(x) = \sqrt{x+2} - 2$ $f(x-2)$ $f(-1)$	2. State the domain of the function $g(x) = 2x-4 $
3. Determine whether the equation represents y as a function of x . $x^2 + y^2 = 25$	4. Determine whether the equation represents y as a function of x . $\frac{x-2}{x^2-4}$

1.1 Function Basics Form A	1.1 Function Basics Form B
Name _____	Name _____
Date _____ Period _____	Date _____ Period _____
Evaluate the function $f(x) = 5 - \sqrt{x}$ at each specified value and simplify.	Evaluate the function $f(x) = 3 - \sqrt{x+1}$ at each specified value and simplify.
1. $f(9)$	1. $f(3)$
2. $f(9x^2)$	2. $f(x-1)$
3. State the domain of the function $g(x) = \sqrt{x-2}$	3. State the domain of the function $g(x) = 3 - \sqrt{x}$
4. Determine whether the equation represents y as a function of x . $2x^2 - y^2 = 4$	4. Determine whether the equation represents y as a function of x . $x + y^2 = 5$
Grade: _____	Grade: _____

Daily Lesson Quiz