

IN-CLASS LESSON PLAN

Topic or concept: Pre-Calculus (Math 1040): Domain and Range of Functions

Basic objectives for preparatory work:

1. Write sets in standard notation (inequality notation, set-builder notation, interval notation)
2. Given a line graph, describe the set of values in set-builder notation and interval notation
3. State the definition of domain and range of functions
4. Find the domain and range of a function as a set of ordered pairs

Advanced objectives for classwork & after class work:

1. Find the domain and range of a function written in equation form (including a fraction and/or an even root)
2. Determine domain and range from a graph
3. Write the formula for a piecewise function
4. Graph a given piecewise function

	Time planned	Activity	Rationale	Resources
Beginning of class period	5 minutes	Review pre-class quiz problems based on the performance results collected on MyOpenMath.com.	Clear up any general confusion or misconceptions.	Paper
Middle of period	20 minutes	Mini-lecture on finding domain and range of a function either written in equation form or given its graph (advanced LO 1 & 2).	Introduce new information (advanced LO1 & 2) based on concepts in preparatory activities (basic LO4).	Lecture prep
Middle of period	20 minutes	Have students work in small groups to practice finding domain and range of functions (rational functions, radical functions, and functions given in graphs).	Practice solving problems and articulating solutions.	Problem sheets (see below for a list of sample practice problems)

	Time planned	Activity	Rationale	Resources
Middle of period	5 minutes	Have some groups show their solutions on the board during the previous session. The instructor comment on the work and lead discussion.	Allow students to check their work and discuss with group members.	Paper, extra chalk/white board in classroom.
Middle of period	15 minutes	Mini-lecture on piecewise functions and their graphs (advanced LO 3 & 4).	Introduce more advanced concepts.	Lecture prep.
Middle of period	10 minutes	Have students work in small groups to practice writing and graphing piecewise functions.	Practice solving problems and articulating solutions.	Problem sheets (see below for a list of sample practice problems).
Middle of period	5 minutes	Have some groups show their solutions on the board during the previous session. The instructor comment on the work and lead discussion.	Allow students to check their work and discuss with group members.	Paper, extra chalk/white board in classroom.
End of period	10 minutes	RSQC (Recall, Summarize, Question, Review, Connect, Comment).	Students solidify understanding in preparation for doing advanced work at home.	Worksheet for after class advanced practice. (See worksheet in advanced practice)

Resources

Sample in-class practice problems:

- Find the domain of $f(x) = x^3 - x$.
- Find the domain of $g(t) = -2t^2$.
- Find the domain of $f(x) = \frac{1+4x}{2x-1}$.
- Find the domain of $p(x) = \frac{x-28}{(x-5)(x+1)}$.
- Find the domain of $f(x) = \sqrt{5 + 2x}$.
- Find the domain of $f(x) = \sqrt{7x - 4}$.

GUIDED PRACTICE

Class: Math 1040 Pre-Calculus

Lesson: Domain and Range

Time estimate to complete this assignment: 50 minutes

Overview/Introduction

Background:

This course is intended primarily for students in the majors that require Calculus I (Math 2110).

Introduction to Lesson:

The previous section (functions and function notation) covers the concept of functions and introduces the concepts of domain and range. In this section, the students will practice determining domains and ranges of specific functions and expressing domains and ranges in appropriate mathematical notations.

During the week before the class, the students will read the corresponding section of the online textbook and watch tutorial videos that explain different mathematical notations for denoting sets (inequality notation, set-builder notation, and interval notation). Students will also learn, by reading the textbook, to determine the domain and range of a function that is defined as a set of ordered pairs.

Learning Objectives

Basic objectives

1. Write sets in standard notation (inequality notation, set-builder notation, interval notation)
2. Given a line graph, describe the set of values in set-builder notation and interval notation
3. State the definition of domain and range of functions
4. Find the domain and range of a function as a set of ordered pairs

Advanced objectives

1. Find the domain and range of a function written in equation form (including a fraction and/or an even root)
2. Determine domain and range from a graph
3. Write the formula for a piecewise function
4. Graph a given piecewise function

Preparatory Activities and Resources:

Activity	Purpose	Estimated time	Learning objectives
Read “Characteristics of Functions” in section 5.1 (MyOpenMath.com)	Review the concept of domain and range	5 minutes	Basic 3
Read “Standard Notation for Defining Sets” in section 5.2 (MyOpenMath.com)	Introduce students to basic notations for defining sets	15 minutes	Basic 1&2
Watch video “Interval Notation” https://youtu.be/hqg85P0ZMZ4	Explain the interval notation for denoting sets	8 minutes	Basic 1&2
Watch video “Set-builder Notation” https://youtu.be/rPcGeaDRnyc	Explain the set-builder notation for denoting sets	7 minutes	Basic 1&2
Complete a short quiz (2 questions) on MyOpenMath.com worth 2 points.		5 minutes	Basic 1&2
Read “Example: Finding the domain of a function as a set of ordered pairs” in section 5.2 (MyOpenMath.com)	Explain the approach for finding domains and ranges of functions that are defined as sets of ordered pairs	10 minutes	Basic 4
Complete a quiz question on MyOpenMath.com worth 1 point.			
All Preparatory Activities are due one day before the class meeting time.			

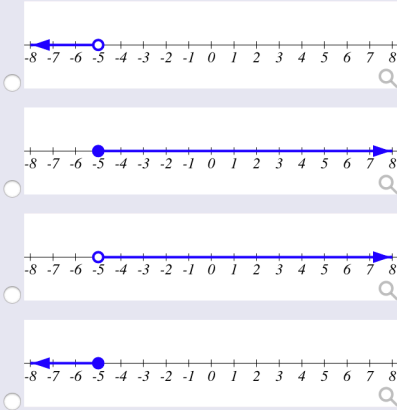
Preparatory Resources:

- Online textbook (access through MyOpenMath.com)
- Video “Interval Notation”: <https://youtu.be/hqg85P0ZMZ4>
- Video “Set-builder Notation”: <https://youtu.be/rPcGeaDRnyc>
- Sample preparatory quiz problems (see below).

Questions?

Any questions related to pre-class guided practice should be posted on the online discussion board/forum (Piazza.com or MyOpenMath.com). For other questions: instructor’s email.

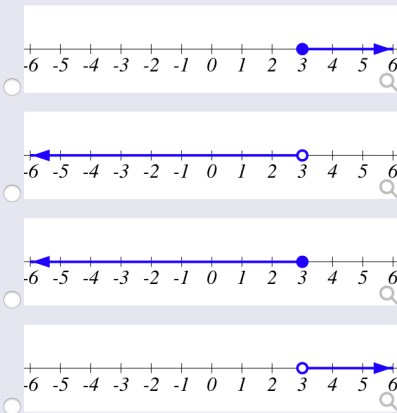
Which of the following graphs corresponds to the following set?
 $\{x \mid x > -5\}$



Show Answer

Sample quiz problem on set-builder

Which of the following graphs corresponds to the following interval?
 $(-\infty, 3)$



Show Answer

Sample quiz problem on interval

Domain and Range
<p>The function $f(x)$ is defined as a set of ordered pairs. Using that set of data, identify the Domain and Range of $f(x)$.</p> <p>Write your answer as an ordered list enclosed in curly brackets.</p>
$f(x) = \{(-5, 1), (4, 93), (9, 87), (16, 51), (24, 22), (46, 82)\}$
Domain: <input style="width: 150px;" type="text"/>
Range: <input style="width: 150px;" type="text"/>

Get help: [Video](#)

Show Answer

Show Answer

Sample quiz problem on finding domain and range of a function given as a set of ordered pairs

ADVANCED PRACTICE

This is given for students to complete after the class meeting in which they work together.

Class: Math 1040 Pre-Calculus

Lesson: Domain and Range

Time estimate to complete this assignment: 2 hours

Learning Objectives

Advanced objectives

1. Find the domain and range of a function written in equation form (including a fraction and/or an even root)
2. Determine domain and range from a graph
3. Write the formula for a piecewise function
4. Graph a given piecewise function

Activities & deliverables

1. Read the lecture notes on section 5.2 (Domain and Range). Then complete the after-class worksheet BEFORE working on homework problems.
2. Complete the online homework assignment for section 5.2. on MyOpenMath.com.
3. The worksheet from item 1 is due at the beginning of next class meeting. The online homework is due two days after this lecture.

Resources:

1. Online textbook section 5.2 on MyOpenMath.com.
2. After class worksheet (see below).
3. Video "Example: domain of rational functions": https://youtu.be/v0lhvzCc_I
4. Video "Example: domain and range of square root functions": https://youtu.be/lj_JB8sfyIM
5. Video "Example: determine the domain and range of the graph of a function": <https://youtu.be/QAxZEellnJc>
6. Video "Example: graph a piecewise defined function": <https://youtu.be/B1jfpil-QQ8>

Questions?

Any questions related to pre-class guided practice should be posted on the online discussion board/forum (Piazza.com or MyOpenMath.com). For other questions: instructor's email.

Post-class Worksheet

Section 5.2 Domain and Range Class Date: _____ Name: _____

Instructions:

- Complete this worksheet BEFORE you start the online homework assignment.
- You may need to review the online textbook section 5.2 and the lecture notes to complete this worksheet.
- The completed worksheet is due at the beginning of our next class meeting.

1. State the definition of the domain and range of a function.

2. (Annotated problem solving) Given two functions $f(x) = \frac{1}{x+1}$ and $g(x) = \sqrt{x+1}$.

- What are the restrictions on the inputs of these two functions?
- Describe the steps you would do to find the domains of these functions. Make sure to explain each step.

3. Summarize the domains and ranges of the following toolkit functions:

- Constant function $f(x) = c$.
- Identity function $f(x) = x$.
- Absolute value function $f(x) = |x|$.
- Quadratic function $f(x) = x^2$.
- Cubic function $f(x) = x^3$.
- Reciprocal function $f(x) = \frac{1}{x}$.
- Reciprocal squared function $f(x) = \frac{1}{x^2}$.
- Square root function $f(x) = \sqrt{x}$.
- Cube root function $f(x) = \sqrt[3]{x}$.

Write the domain and ranges in both set-builder notation and the interval notation.