5-1 and 5-2 Activity Draft

Give story problems: What does domain/range represent in context? E.g., MFG: 2.6 HW. Not just interval, but units, quantities (usually different: e.g., hours worked to dollars).

FM 2.2:Relevant domain for a model is a domain that fits the situation. For each of the following models (2730) give the relevant domain using inequality notation and explain your reasoning in a full sentence. Some problems will have more than one correct answer, so do your best to explain.

FM 2.2 #31: Which function is only decreasing? (A) Outdoor temperature as a function of time. (B) The Dow Jones Industrial Average as a function of time. (C) Air pressure in the Earth’s atmosphere as a function of altitude. (D) World population since 1900 as a function of time. (E) Water pressure in the ocean as a function of depth.

FM 2.2: (Like 1151: Give info about function and ask to graph):Sketch (freehand) a graph of a function ݂ with domain all real numbers that satisfies all of the following conditions: a. There are no breaks in the graph (it is continuous). b. ݂ሺ0ሻ ൌ 2 c. ݂ሺ3ሻ ൌ 0 d. ݂ሺ5ሻ ൌ ݂ሺ0ሻ e. ݂ is increasing on ሺെ∞, 0ሻ and on ሺ3, 5ሻ f. ݂ is decreasing on ሺ0, 3ሻ and on ሺ5, ∞ሻ

FM 2.2 (#35): Let ݂ be a polynomial function with degree greater than 2 (cubic, quartic, etc). If ്ܾܽ and ݂ሺܽሻ ൌ ݂ሺܾሻ ൌ 3, which of the following must be true for at least one value of ݔ between ܽ and ܾ. (One, both, or neither could be true.) Explain your reasoning in full sentences. I. ݂ሺݔሻ ൌ 0 at least once. II. ݂ሺݔሻ has at least one maximum or minimum. Hint: Use the graph to help you draw a picture that proves or disproves each statement.

FM 2.2 (#34): Mr. Brust’s flip‐flops are thrown into the air by a catapult. Their height (measured in feet) is modeled by the equation ݄ሺݐሻ ൌ െ16ݐଶ ൅ 85ݐ ,where ݐ is seconds. I. What is the relevant domain of this model (use a graphing calculator)? What does it represent? II. What is the relevant range of this model (Use a graphing calculator)? What does it represent?

FM 3.1: Many formula: Find Domain (rational and radical.

FM 3.1: 1 . Mr. Kelly wants to create a rectangular feeding pen for his pigs, but only has 50 meters of fencing. He decides to use the side of his house as one side of the pen. a. Draw a picture of this scenario and label the sides. Use x as the side of the pen that is perpendicular to his house. b. Write an equation for the area A of the pen in terms of x. c. What is the domain of the function A. (determined by the physical restrictions)?

2. Mr. Brust has finally reached his dream in life and is going to live on a deserted island as a hermit and grow out a goatee. The problem is he needs to get freshwater out to the island from the mainland. The island is 8 miles offshore. It costs $10,000 per mile to lay pipe on land and $15,000 per mile to lay the pipe in the lake (see picture below). a. Express the total cost C of constructing the pipeline as a function of x. b. What is the domain of the function C? (Hint: there are restrictions based on the possible values of x.)

S-Z p. 58 (also p. 65): Find the domain of the following functions. 1. g(x) = √ 4 − 3x 2. h(x) = √5 4 − 3x 3. f(x) = 2 1 − 4x x − 3 4. F(x) = √4 2x + 1 x 2 − 1 5. r(t) = 4 6 − √ t + 3 6. I(x) = 3x 2 /x

S-Z p. 85: In Exercises 11 - 20, use the pair of functions f and g to find the domain of the indicated (combo) function then find and simplify an expression for it. (f + g)(x) (f − g)(x) (fg)(x) f g (x) 11. f(x) = 2x + 1 and g(x) = x − 2 12. f(x) = 1 − 4x and g(x) = 2x − 1 13. f(x) = x 2 and g(x) = 3x − 1 14. f(x) = x 2 − x and g(x) = 7x 15. f(x) = x 2 − 4 and g(x) = 3x + 6 16. f(x) = −x 2 + x + 6 and g(x) = x 2 − 9 17. f(x) = x 2 and g(x) = 2 x 18. f(x) = x − 1 and g(x) = 1 x − 1 19. f(x) = x and g(x) = √ x + 1 20. f(x) = √ x − 5 and g(x) = f(x) = √ x –

S-Z p. 394: 5.2.1: In Exercises 1 - 20, show that the given function is one-to-one and find its inverse. Check your answers algebraically and graphically. Verify that the range of f is the domain of f −1 and vice-versa.

S-Z p. 429 6.1.1: 426 In Exercises 43 - 57, find the domain of given function (exp/log)

Active Reading: 2.1.1: Consider shopping online at a t-shirt company. Each t-shirt costs $13.00,$13.00, and each time you click on the “add to shopping cart” button, your account adds a charge for $13.00.$13.00.

Let CC represent the cost in dollars of purchasing NN t-shirts. Therefore, C=f(N).C=f(N).

What are the possible input values in this situation? In other words: what is the *domain* of the function ff ?

What are the possible output values in this situation? In other words: what is the *range* of the function ff ?

T-shirt cost function: Enter the cost of buying N t-shirts.

|  |  |
| --- | --- |
| N | C=f(N) |
| 0 |  |
| 1 |  |
| 2 |  |
| 3 |  |
| 4 |  |
| 5 |  |

Look at the inputs for N from the table.

Is it possible to buy 3.1415 t-shirts?

yes  
 no

Is it possible to buy −7 t-shirts?

yes  
 no

How would you classify all the possible input values?

?

all integers

all real numbers

only non-negative integers

only zero to 100

?

This is the domain of our function.

Now look at all the outputs C from the table.

Is it possible that the cost will be $14 or $15 or $16?

yes  
 no

How would you classify all the output values?

?

only positive numbers

all real numbers

only whole numbers

non-negative integer multiples of 13

This is the range of our function.

Active Reading: 2.1.11: Use Geogebra to determine domain/range.

Active Reading: 2.3.9: Dom of Piecewise:  
 The cost of renting a snowboard is $25$25 per day, or $60$60 for three days, or $75$75 for a week.

The first cost function is $25$25 per day and is good for 11 or 22 days. The domain of this function is the “11 or 22 days”. It tells you when to use this cost function.

On the third day is a new cost function, a simple constant of $60.$60.

Finally, the constant function $75$75 is used when we keep the snowboard for more than 33 days, up to 77 days (a full week).

Each rule has its own domain that tells us when to use the rule. In [Figure 2.3.10](https://www.mhcc.edu/precalc1/domain-and-range-piecewise-gist.html), we see the graph of the price function. Notice the graph has a constant output of 5050 when 1<x≤2,1<x≤2, but it immediately changes to 6060 when x>2.

Active Reading: 2.3.12: Dom Piecewise: A hot cup of coffee sits on a counter and begins to cool down. The rate at which the coffee cools is related to the temperature of the coffee and the temperature in the room (there's actually a formula for that). The formula is good for as long the situation in the room remains the same. If you suddenly change the room conditions by turning on the air conditioner, then the rate at which the coffee cools will also change. There would be a new formula to model the coffee's temperature after the air conditioner is switched on.One formula is good from the time you pour the coffee up until you switch on the air conditioner. Then the other formula takes over after the air conditioner has been turned on.

Do a piecewise function that has 1/(x-4) for x>3 (i.e., 4 is OK).

Active Reading: 2.3.20: Use the graph of y=h(x) below to answer the questions that follow. If a value does not exist, you should type *DNE*.

Evaluate h(−2). Answer:

Evaluate h(4). Answer:

Solve h(x)=8. Answer:

?

x

y

=

Assuming the graph continues forever in the directions indicated by the arrows, how many solutions are there to the equation h(x)=6? Answer:

?

0

1

2

3

infinitely many

Choose a hole in the graph that could be filled and still cause h to be a function of x. Enter your answer as an (x,y) point. Answer

Active Reading: 2.3.23: Given piecewise function formula: Evaluate f(−2). Answer:

Evaluate f(1). Answer:

How many solutions are there to the equation f(x)=2?

Answer:

?

one

two

three

infinitely many

How many solutions are there to the equation f(x)=3?

Answer:

?

one

two

three

infinitely many

Active Reading 2.3 HW #8 (#7 plugs in values); A tennis ball is dropped from a height of 16 feet. It’s height (in feet) above the ground can be modeled by the piecewise function

H(t)={16(1−t2)0≤t≤1(4−4t)(4t−10)1<t≤2.5

where t is measured in seconds after it was dropped.

Solve the equation H(t)=15?

Answer: t=

?

feet

seconds

One solution to the equation H(t)=0 is t=1 second. What is the other solution?

Answer: t=

?

feet

seconds

Active Reading 2.3 HW #11: Let y=f(x) be the piecewise defined function given below.  
 f(x)={1−x, if x≤−1,2, if −1<x<1,x+1, if x≥1.

a. f(−2)= [help (numbers)](https://webwork-ptx.aimath.org/)   
b. f(1)= [help (numbers)](https://webwork-ptx.aimath.org/)   
c. For what values of x is f(x)=2?  
   
 [help (inequalities)](https://webwork-ptx.aimath.org/)   
d. Find the domain and range of f. *(You may find it helpful to graph this function on your own paper to find the domain and range.)* Your answers must be inequalities (not intervals).  
   
Domain: [help (inequalities)](https://webwork-ptx.aimath.org/) Range: [help (inequalities)](https://webwork-ptx.aimath.org/)

Active Reading 2.3 HW #15: Match the functions with their graphs. Enter the letter of the graph below which corresponds to the function. ( **Click on image for a larger view** )

**1.** Piecewisefunction:f(x)=x,ifx≤0andf(x)=x+1,ifx>0  
 **2.** Piecewisefunction:f(x)=1−x2,ifx≤2andf(x)=x,ifx>2  
 **3.** Piecewisefunction:f(x)=1,ifx≤1andf(x)=x+1,ifx>1  
 **4.** Piecewisefunction:f(x)=2x+3,ifx<−1andf(x)=3−x,ifx≥−1

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| A | B | C | D |

Active Reading 2.3 HW #16: Choose the graph that represents the piecewise function

*f(x)={−32x−2for x≤−335x+1for x>−3*

from the above choices. You may click a graph to enlarge it.

Correct Letter:

APC: p. 15 Activity 1.2.2: Activity 1.2.2. Consider a spherical tank of radius 4 m that is filling with water. Let V be the volume of water in the tank (in cubic meters) at a given time, and h the depth of the water (in meters) at the same time. It can be shown using calculus that V is a function of h according to the rule V f (h) π 3 h 2 (12 − h). a. What values of h make sense to consider in the context of this function? What values of V make sense in the same context? b. What is the domain of the function f in the context of the spherical tank? Why? What is the corresponding codomain? Why? c. Determine and interpret (with appropriate units) the values f (2), f (4), and f (8). What is important about the value of f (8)? d. Consider the claim: “since f (9) π 3 9 2 (12 − 9) 81π ≈ 254.47, when the water is 9 meters deep, there is about 254.47 cubic meters of water in the tank”. Is this claim valid? Why or why not? Further, does it make sense to observe that “ f (13) − 169π 3 ”? Why or why not? e. Can you determine a value of h for which f (h) 300 cubic meters?

APC: p. 23: HW#6: An open box is to be made from a flat piece of material 20 inches long and 6 inches wide by cutting equal squares of length xfrom the corners and folding up the sides. Write the volume Vof the box as a function of x. Leave it as a product of factors, do not multiply out the factors. If we write the domain of the box as an open interval in the form (a, b), then what is a and what is b?

Dom/Range of Exponential Example? (e.g., Newton’s)? e.g., APC: p. 170 3.2.3.

MFG: 2.104: 2.6: Do the largest and smallest values in the domain of a function result in the largest and smallest values of the range? Give an example.

MFG 2.6 2.105: The domain of the function f(x) is [−4,4]. What is the domain of the function g(x)=1/2f(x)?[−2,2][−8,8][−4,4][4, -4]

MFG 2.6: HW #13 (and others 13-17): The graph shows the elevation of the Los Angeles Marathon course as a function of the distance into the race, a=f(t).a=f(t). Estimate the domain and range of the function. (Source: Los Angeles Times)

MFG: 2.6: For Problems 31-38, decide whether the given value is in the range of the function. If so, find the domain value(s) that produce each range value.

MFG 2.6 HW: For Problems 39–50,

Use a graphing calculator to graph each function on the given domain. Using the TRACE key, adjust ***Ymin*** and ***Ymax*** until you can estimate the range of the function.

Verify your answer algebraically by evaluating the function. State the domain and range in interval notation.

MFG 2.6 HW #66: A semicircular window has a radius of 2 feet. The area of a sector of the window (a pie-shaped wedge) is a function of the angle at the center of the circle. Give the domain and range of this function.

Range of given quadratic (Don’t mention “vertex”.)

ORCCA: 11.2 (III-93): HW#9-36: Several graphs (holes, asymptotes, etc.): Find Dom/Range

ORCCA: 11.2 HW#37-68: Several formulas (e.g., SQRT(2+x)/(8-x)

ORCCA: 11.2 HW #69: Thanh bought a used car for $7,800. The car’s value decreases at a constant rate each year. After 5 years, the value decreased to $6,300. Use a function to model the car’s value as the number of years increases. Find this function’s domain and range in this context.

ORCCA 11.2 HW #80: From a clifftop over the ocean 324.87 m above sea level, an object was shot straight up into the air with an initial vertical speed of 93.59 m s . On its way down it missed the cliff and fell into the ocean, where it floats on the surface. Its height (above sea level) as time passes can be modeled by the quadratic function f, where f(t) = −4.9t2 + 93.59t + 324.87. Here t represents the number of seconds since the object’s release, and f(t) represents the object’s height (above sea level) in meters. Find the function’s domain and range in this context.

ORCCA 11.2 HW#83: You will build a rectangular sheep pen next to a river. There is no need to build a fence along the river, so you only need to build three sides. You have a total of 480 feet of fence to use. Find the dimensions of the pen such that you can enclose the maximum area. Use a function to model the area of the rectangular pen, with respect to the length of the width (the two sides perpendicular to the river). Find the function’s domain and range in this context.

ORCCA: 11.2 HW #85: For each part, sketch the graph of a function with the given domain and range. a. The domain is (0, ∞) and the range is (−∞, 0). b. The domain is (1, 2) and the range is (3, 4). c. The domain is (0, ∞) and the range is [2, 3]. d. The domain is (1, 2) and the range is (−∞, ∞). e. The domain is (−∞, ∞) and the range is (−1, 1). f. The domain is (0, ∞) and the range is [0, ∞).

ORCCA 12.1 (p. III-141): Find dom/rng: Example 12.1.2 When a drug is injected into a patient, the drug’s concentration in the patient’s bloodstream can be modeled by the function C, with formula C(t) = 3t t 2 + 8 where C(t) gives the drug’s concentration, in milligrams per liter, t hours since the injection. A new injection is needed when the concentration falls to 0.35 milligrams per liter. Using graphing technology, we will graph y = 3t t 2+8 and y = 0.35 to examine the situation and answer some important questions. 1 2 3 4 5 6 7 8 9 10 11 0.25 0.5 0.75 y = C(t) y = 0.35 (1.066,0.35) (7.506,0.35) (2.828,0.53) t, time in hours y, concentration (mg per liter) Figure 12.1.3: Graph of C(t) = 3t t 2+8 a. What is the concentration after 10 hours? b. After how many hours since the first injection is the drug concentration greatest? c. After how many hours since the first injection should the next injection be given? d. What happens to the drug concentration if no further injections are given?

ORCCA: 12.1 #7-20formulas and #21-28 Graphs of rational functions.

ORCCA 12.1: HW #31 (and other stories- find range): In a forest, the number of deer can be modeled by the function f(t) = 60t+630 0.3t+9 , where t stands for the number of years from now. Answer the question with technology. As time goes on, the population levels off at approximately deer living in the forest.

ORCCA: 12.4: Simplifying complex rational expressions (find domain?)